



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

Request For Bids For Construction Services

Two-Stage Bidding Process

Stage II – General Contractor's Bidding List Invitation to Bid

January 4, 2006

THAYNE CENTER AND ALUMNI ASSOCIATION REMODEL

REDWOOD ROAD CAMPUS SALT LAKE COMMUNITY COLLEGE SALT LAKE CITY, UTAH

DFCM Project No. 05288660

HFS Architects
329 S. Rio Grande
Salt Lake City, Utah 84101

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Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at <http://dfcm.utah.gov> or are available upon request from DFCM:

DFCM General Conditions dated May 25, 2005

DFCM Application and Certificate for Payment dated May 25, 2005

Technical Specifications:

Drawings:

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at <http://dfcm.utah.gov>

INVITATION TO BID

**ONLY CONTRACTORS PREVIOUSLY SHORT-LISTED DURING STAGE I
ARE ALLOWED TO BID ON THIS PROJECT**

The State of Utah - Division of Facilities Construction and Management (DFCM) is requesting bids for the construction of the following project:

THAYNE CENTER AND ALUMNI ASSOCIATION REMODEL
REDWOOD ROAD CAMPUS - SALT LAKE COMMUNITY COLLEGE
SALT LAKE CITY, UTAH
DFCM PROJECT NO: 05288660

Project Description: Demolition and remodel of existing office space. Construction cost estimate: \$121,000

<u>FIRM NAME</u>	<u>POINT OF CONTACT</u>	<u>PHONE</u>	<u>FAX</u>
ABCO Construction, Inc.	Mr. Reed Price	(435) 723-3770	(435) 723-3311
Ascent Construction	Mr. Dan Wall	(801) 299-1711	(801) 299-0663
Bellock Construction, Inc	Ms. Melody Bellock	(801) 277-7805	(801) 277-5751
Broderick and Henderson Const	Mr. Gary Broderick	(801) 225-9213	(801) 225-4697
Cal Wadsworth Construction	Mr. Cal Wadsworth	(801) 208-1957	(801) 208-1975
Chad Husband Construction, Inc	Mr. Richard Marshall	(801) 972-1146	(801) 886-1784
Control Inc.	Mr. Ralph B. Burk	(801) 561-2263	(801) 561-2305
Darrell Anderson Construction	Mr. James Anderson	(435) 752-6860	(435) 752-7606
Garff Construction	Mr. Phil Henriksen	(801) 973-4248	(801) 972-1928
Gramoll Construction	Mr. Ken Romney	(801) 295-2341	(801) 295-2356
Jepson Construction	Mr. Rick Jepson	(801) 774-8860	(801) 773-8980
Keller Construction	Mr. S. Daniel Hill	(801) 972-1018	(801) 972-1063
McCullough Engineering	Mr. Jim McCullough	(801) 466-4949	(801) 466-4989
Saunders Construction	Mr. Edward Saunders	(801) 782-7830	(801) 782-7856
Spectrum Construction of Utah	Mr. Ronald Snowden	(801) 915-6222	(801) 607-2203
Valley Design and Construction	Mr. Corey King	(801) 927-9542	(801) 927-9544
Wade Payne Construction, Inc.	Mr. Wade Payne	(801) 226-6144	(801) 226-7772

The bid documents will be available at 2:00 PM on Wednesday, January 4, 2006 in electronic format from DFCM at 4110 State Office Building, Salt Lake City, Utah 84114, telephone (801) 538-3018 and on the DFCM web page at <http://dfcm.utah.gov>. For questions regarding this project, please contact Kurt Baxter, Project Manager, DFCM, at (801) 538-3174. No others are to be contacted regarding this project.

A **MANDATORY** pre-bid meeting and site visit will be held at 2:00 PM on Friday, January 6, 2006 in Room 219 of the Student Center at the Redwood Road Campus of the Salt Lake Community College in Salt Lake City, Utah. All short-listed prime contractors wishing to bid on this project must attend this meeting.

Bids must be submitted by 3:00 PM on Wednesday, January 18, 2006 to DFCM. **DURING THE 2006 LEGISLATIVE SESSION, THE BIDS WILL BE RECEIVED, OPENED, AND READ ALOUD IN THE CONFERENCE CENTER BUILDING AT THE UTAH STATE FAIRPARK, 155 NORTH 1000 WEST, SALT LAKE CITY, UTAH.** Note: Bids must be received at the Conference Center Building at the Utah State Fairpark by the specified time. The contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah. A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid. The Division of Facilities Construction & Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of the State.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
MARLA WORKMAN, CONTRACT COORDINATOR
4110 State Office Bldg., Salt Lake City, Utah 84114

STAGE II BIDDING PROCESS

ONLY CONTRACTORS PREVIOUSLY SHORT-LISTED DURING STAGE I ARE ALLOWED TO BID ON THIS PROJECT

1. Invitational Bid Procedures

Invitation to Bid: DFCM will notify each short-listed firm via e-mail and/or fax when a project is ready for construction services.

Bid Documents: Bidding documents including plans and specifications (if applicable) may be obtained by accessing DFCM's web page at <http://dfcm.utah.gov> or at DFCM's office 4110 State Office Building, Salt Lake City, Utah 84114.

Mandatory Pre-Bid Site Meeting: If required, the schedule contained in this document will indicate the date, time, and place of the mandatory pre-bid site meeting. At this meeting, contractors will receive additional instructions about the project and have an opportunity to ask questions about project details. If a firm fails to attend a pre-bid site meeting labeled "Mandatory" they will not be allowed to bid on the project.

Written Questions: The schedule contained in this document will indicate the deadline for submitting questions in writing to the DFCM Representative pertaining to this project.

Final Addendum: The schedule contained in this document will indicate the deadline for DFCM issuing the final addendum clarifying questions and changes to the scope of work. Contractors are responsible for obtaining and responding to information contained in the addenda.

Submitting Bids: Bids must be submitted to DFCM by the deadline indicated on the schedule contained in this document. **DURING THE 2006 LEGISLATIVE SESSION, THE BIDS WILL BE RECEIVED, OPENED, AND READ ALOUD IN THE CONFERENCE CENTER BUILDING AT THE UTAH STATE FAIRPARK, 155 NORTH 1000 WEST, SALT LAKE CITY, UTAH.** Bids submitted after the deadline will not be accepted. (Additional information pertaining to bidding is contained later in this document).

Subcontractors List: The firm selected for the project must submit a list of all subcontractors by the deadline indicated on the schedule contained in this document. (Additional information pertaining to subcontractor lists is contained later in this document)

2. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Notice to Contractors.

3. **Bids**

Before submitting a bid, each bidder shall carefully examine the Contract Documents; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Notice to Contractor's prior to the published deadline for the submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. **THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.**

If the bid bond security is submitted on a bid bond form other than the DFCM's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. **Note: A cashier's check cannot be used as a substitute for a bid bond.**

4. **Contract and Bond**

The Contractor's Agreement will be in the form bound in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the Contract Sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for Subcontractors will be specified in the Supplementary General Conditions.

5. **Listing of Subcontractors**

Listing of Subcontractors shall be as summarized in the “Instructions and Subcontractor’s List Form”, which are included as part of these Contract Documents. The subcontractors list shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contract for a period of up to three years.

6. **Interpretation of Drawings and Specifications**

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Representative a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by Addenda duly issued and a copy of such Addenda will be mailed or delivered to each person or entity receiving a set of documents. Neither DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

7. **Addenda**

Any Addenda issued during the time of bidding shall become part of the Contract Documents made available to the bidders for the preparation of the bid, shall be covered in the bid, and shall be made a part of the Contract.

8. **Award of Contract**

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. The DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

9. **DFCM Contractor Performance Rating**

DFCM will evaluate the performance of the Contractor. This evaluation may include comments from the User. The Contractor will have an opportunity to review and comment on the evaluation. Evaluations, including the Contractor's comments, may be considered in future selection in the evaluation of the Contractor's past performance.

10. **Licensure**

The Contractor shall comply with and require all of its Subcontractors to comply with the license laws as required by the State of Utah.

11. **Right to Reject Bids**

DFCM reserves the right to reject any or all Bids.

12. **Time is of the Essence**

The completion deadline for this project is **Wednesday, April 25, 2006**. Failure to meet the completion deadline may result in a poor performance rating from DFCM which may have a negative impact on your firm's ability to obtain future work with the state of Utah and may also result in liquidated damages being assessed. Time is of the essence in regard to all the requirements of the Contract Documents.

13. **Withdrawal of Bids**

Bids may be withdrawn on written request received from bidders within 24 hours after the bid opening if the contractor has made an error in preparing the bid.

14. **Product Approvals**

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed

the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued Addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

15. **Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors**

Contractors shall respond promptly to any inquiry in writing by the DFCM to any concern of financial responsibility of the Contractor, Subcontractor or Sub-subcontractor.

16. **Debarment.**

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by the DFCM as part of the requirements for award of the Project.

**Division of Facilities Construction and Management****PROJECT SCHEDULE****Stage II = Two-Stage Bidding Process****PROJECT NAME: THAYNE CENTER AND ALUMNI ASSN REMODEL-REDWOOD ROAD CAMPUS
SALT LAKE COMMUNITY COLLEGE – SALT LAKE CITY, UTAH****DFCM PROJECT #: 05288660**

Event	Day	Date	Time	Place
Stage II Bidding Documents Available	Wednesday	January 4, 2006	2:00 PM	DFCM, 4110 State Office Building, SLC, UT and DFCM web site *
Mandatory Pre-bid Site Meeting	Friday	January 6, 2006	2:00 PM	Student Center Room 219 SLCC Redwood Road Campus Salt Lake City, UT
Last Day to Submit Questions	Tuesday	January 10, 2006	4:00 PM	DFCM, 4110 State Office Building, SLC, UT
Final Addendum Issued	Thursday	January 12, 2006	4:00 PM	DFCM, 4110 State Office Building, SLC, UT or DFCM web site*
Prime Contractors Turn in Bid and Bid Bond	Wednesday	January 18, 2006	3:00 PM	Conference Center Building Utah State Fairpark 155 West 1000 North Salt Lake City, UT **
Subcontractors List Due	Thursday	January 19, 2006	3:00 PM	DFCM, 4110 State Office Building, SLC, UT FAX TO: 801-538-3677
Project Completion Date	Wednesday	April 25, 2006	5:00 PM	

* **DFCM's web site address is <http://dfcm.utah.gov>**

** **Due to the limited parking on Capitol Hill and anticipated shortage of parking during the 2006 Legislative Session, all bids will be received, opened, and read at the Conference Center at the Utah State Fairpark. Refer to map on the DFCM web site for directions (http://dfcm.utah.gov/project_center/ads_solicitations.htm)**



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the Request for Bids for the **THAYNE CENTER AND ALUMNI ASSOCIATION REMODEL – REDWOOD ROAD CAMPUS – SALT LAKE COMMUNITY COLLEGE – SALT LAKE CITY, UTAH DFCM PROJECT # 05288660** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS (\$_____) (In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by **April 25, 2006** after receipt of the Notice to Proceed, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **\$300.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

BID FORM
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Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract. The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable 100% Performance and Payment bonds are not delivered within time set forth.

Type of Organization:

(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

Respectfully submitted,

Name of Bidder

ADDRESS:

Authorized Signature

BID BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of \$ _____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____.

Principal's name and address (if other than a corporation):

By: _____

Title: _____

Principal's name and address (if a corporation):

By: _____

Title: _____
(Affix Corporate Seal)

Surety's name and address:

By: _____
Attorney-in-Fact (Affix Corporate Seal)

STATE OF _____)
COUNTY OF _____) ss.

On this ____ day of _____, 20_____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My Commission Expires: _____

Resides at: _____

Agency: _____
Agent: _____
Address: _____
Phone: _____

NOTARY PUBLIC

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

**Division of Facilities Construction and Management****INSTRUCTION AND SUBCONTRACTORS LIST FORM**

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, on the following basis:

PROJECTS UNDER \$500,000 - ALL SUBS \$20,000 OR OVER MUST BE LISTED
PROJECTS \$500,000 OR MORE - ALL SUBS \$35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- Bidder must list "Self" if performing work itself.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

BIDDER LISTING 'SELF' AS PERFORMING THE WORK:

Any bidder that is properly licensed for the particular work and intends to perform that work itself in lieu of a subcontractor that would otherwise be required to be on the subcontractor list, must insert the term 'Self' for that category on the subcontractor list form. Any listing of 'Self' on the sublist form shall also include the amount allocated for that work.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A. Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM
Page No. 2

GROUND FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

- (1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
- (2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
- (3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
- (4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
- (5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
- (6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #
ELECTRICAL	ABCD Electric Inc.	\$350,000.00	123456789000
LANDSCAPING	"Self"	300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: 350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

**PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS
SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.**

**Division of Facilities Construction and Management****SUBCONTRACTORS LIST
FAX TO 801-538-3677****PROJECT TITLE:** _____**Caution:** You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____

SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR DFCMS REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY DFCM. ATTACH A SECOND PAGE IF NECESSARY.

FUGITIVE DUST PLAN

The Contractor will fill out the form and file the original with the Division of Air Quality and a copy of the form with the Division of Facilities Construction & Management, prior to the issuance of any notice to proceed.

The Contractor will be fully responsible for compliance with the Fugitive Dust Control Plan, including the adequacy of the plan, any damages, fines, liability, and penalty or other action that results from noncompliance.

Utah Division of Air Quality

April 20, 1999

**GUIDANCE THAT MUST BE CONSIDERED IN DEVELOPING AND SUBMITTING A
DUST CONTROL PLAN FOR COMPLIANCE WITH R307-309-3, 4, 5, 6, 7**

Source Information:

1. Name of your operation (source): provide a name if the source is a construction site.
2. Address or location of your operation or construction site.
3. UTM coordinates or Longitude/Latitude of stationary emission points at your operation.
4. Lengths of the project, if temporary (time period).
5. Description of process (include all sources of dust and fugitive dust). Please, if necessary, use additional sheets of paper for this description. Be sure to mark it as an attachment.
6. Type of material processed or disturbed.
7. Amount of material processed (tons per year, tons per month, lbs./hr., and applicable units).

8. Destination of product (where will the material produced be used or transported, be specific, provide address or specific location), information needed for temporary relocation applicants.
9. Identify the individual who is responsible for the implementation and maintenance of fugitive dust control measures. List name(s), position(s) and telephone number(s).
10. List, and attach copies of any contract lease, liability agreement with other companies that may, or will, be responsible for dust control on site or on the project.

Description of Fugitive Dust Emission Activities
(Things to consider in addressing fugitive dust control strategies.)

1. Type of activities (drilling and blasting, road construction, development construction, earth moving and excavation, handling and hauling materials, cleaning and leveling, etc).
2. List type of equipment generating the fugitive dust.
3. Diagram the location of each activity or piece of equipment on site. Please attach the diagram.
4. Provide pictures or drawings of each activity. Include a drawing of the unpaved/paved road network used to move loads “on” and “off” property.
5. Vehicle miles travels on unpaved roads associated with the activity (average speed).
6. Type of dust emitted at each source (coal, cement, sand, soil, clay, dust, etc.)
7. Estimate the size of the release area at which the activity occurs (square miles). For haul or dirt roads include total miles of road in use during the activity.

Description of Fugitive Dust Emission Controls on Site

Control strategies must be designed to meet 20% opacity or less on site (a lesser opacity may be defined by Approval Order conditions or federal requirements such as NSPS), and control strategies must prevent exceeding 10% opacity from fugitive dust at the property boundary (site boundary) for compliance with R307-309-3.

1. Types of ongoing emission controls proposed for each activity, each piece of equipment, and haul roads.
2. Types of additional dust controls proposed for bare, exposed surfaces (chemical stabilization, synthetic cover, wind breaks, vegetative cover, etc).
3. Method of application of dust suppressant.
4. Frequency of application of dust suppressant.
5. Explain what triggers the use of a special control measure other than routine measures already in place, such as covered loads or measures covered by a permit condition (increase in opacity, high winds, citizen complaints, dry conditions, etc).
6. Explain in detail what control strategies/measures will be implemented off-hours, i.e., Saturdays/Sundays/Holidays, as well as 6 PM to 6 AM each day.

Description of Fugitive Dust Control Off-site

Prevent, to the maximum extent possible, deposition of materials, which may create fugitive dust on public and private paved roads in compliance with R307-309-5, 6, 7.

1. Types of emission controls initiated by your operation that are in place “off” property (application of water, covered loads, sweeping roads, vehicle cleaning, etc.).

2. Proposed remedial controls that will be initiated promptly if materials, which may create fugitive dust, are deposited on public and private paved roads.

Submit the Dust Control Plan to:

Executive Secretary
Utah Air Quality Board
POB 144820
15 North 1950 West
Salt Lake City, Utah 84114-4820

Phone: (801) 536-4000
FAX: (801) 536-4099

Fugitive Dust Control Plan Violation Report

When a source is found in violation of R307-309-3 or in violation of the Fugitive Dust Control Plan, the source must submit a report to the Executive Secretary within 15 days after receiving a Notice of Violation. The report must include the following information:

1. Name and address of dust source.
2. Time and duration of dust episode.
3. Meteorological conditions during the dust episode.
4. Total number and type of fugitive dust activities and dust producing equipment within each operation boundary. If no change has occurred from the existing dust control plan, the source should state that the activity/equipment is the same.
5. Fugitive dust activities or dust producing equipment that caused a violation of R-307-309-3 or the source's dust control plan.
6. Reasons for failing to control dust from the dust generating activity or equipment.
7. New and/or additional fugitive dust control strategies necessary to achieve compliance with R307-309-3, 4, 5, 6, or 7.
8. If it can not be demonstrated that the current approved Dust Control Plan can result in compliance with R307-309-3 through 7, the Dust Control Plan must be revised so as to demonstrate compliance with 307-309-3 through 7. Within 30 days of receiving a fugitive dust Notice of Violation, the source must submit the revised Plan to the Executive Secretary for review and approval.

Submit the Dust Control Plan to:

Executive Secretary	Phone: (801) 536-4000
Utah Air Quality Board	FAX: (801) 536-4099
POB 144820	
15 North 1950 West	
Salt Lake City, Utah 84114-4820	

Attachments: DFCM Form FDR R-307-309, Rule 307-309

CONTRACTOR'S AGREEMENT

FOR:

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____
_____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____
_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ DOLLARS AND NO CENTS (\$_____.00), which is the base bid, and which sum also includes the cost of a 100%

CONTRACTOR'S AGREEMENT
PAGE NO. 2

Performance Bond and a 100% Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete within _____ (____) calendar days after the date of the Notice to Proceed. Contractor agrees to pay liquidated damages in the amount of \$_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Notice to Contractors, Instructions to Bidders/Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the

CONTRACTOR'S AGREEMENT
PAGE NO. 3

Contractor requests payment and agrees to safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

CONTRACTOR'S AGREEMENT
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IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR: _____

Signature Date

Title: _____

State of _____)
County of _____)

Please type/print name clearly

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

(SEAL)

Notary Public

My Commission Expires _____

APPROVED AS TO AVAILABILITY
OF FUNDS:

Financial Manager, Date
Division of Facilities Construction
and Management

**DIVISION OF FACILITIES
CONSTRUCTION AND MANAGEMENT**

Manager - Date
Capital _____

APPROVED AS TO FORM:
ATTORNEY GENERAL
May 25, 2005
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

Division of Finance Date

PERFORMANCE BOND
(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee," in the amount of _____ DOLLARS (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ Dollars (\$ _____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____
(Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____
Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____

Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General
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PAYMENT BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____ authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ Dollars (\$ _____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, 1953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____ (Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____ Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____

Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

**Division of Facilities Construction and Management****CHANGE ORDER #** _____

CONTRACTOR: _____

AGENCY OR INSTITUTION: _____

PROJECT NAME: _____

PROJECT NUMBER: _____

CONTRACT NUMBER: _____

ARCHITECT: _____

DATE: _____

CONSTRUCTION CHANGE DIRECTIVE NO.	PROPOSAL REQUEST NO.	AMOUNT		DAYS	
		INCREASE	DECREASE	INCREASE	DECREASE

	Amount	Days	Date
ORIGINAL CONTRACT			
TOTAL PREVIOUS CHANGE ORDERS			
TOTAL THIS CHANGE ORDER			
ADJUSTED CONTRACT			

DFCM and Contractor agree that the terms, contract sum, scope of the Work and time specified in this Change Order shall constitute the full accord and satisfaction, and complete adjustment to the Contract and includes all direct and indirect costs and effects related to, incidental to, and/or reasonably implied from such change in the contract terms, sum, scope of the Work and time.

Contractor: _____

Date

Architect/Engineer: _____

Date

Agency or Institution: _____

Date

DFCM: _____

Date

Funding Verification: _____

Date

**CERTIFICATE OF SUBSTANTIAL COMPLETION**

PROJECT _____ PROJECT NO: _____

AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

A list of items to be completed or corrected is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof.

The Contractor shall complete or correct the Work on the list of items appended hereto within _____ calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: \$_____.

CONTRACTOR (include name of firm) by: _____ DATE

A/E by: _____ DATE

USING INSTITUTION OR AGENCY by: _____ DATE

DFCM by: _____ DATE

cc: Parties Noted
DFCM, Director

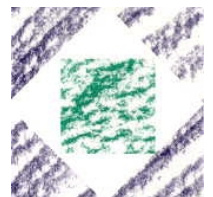
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Salt Lake Community College

Thayne & Alumni Centers Remodel



HFSArchitects



ARCHITECTURE
INTERIORS
PLANNING

ARCHITECT

HFSArchitects
329 S. Rio Grande
Salt Lake City, Utah 84101
(801) 596-0691
FAX (801) 596-0693

MECHANICAL ENGINEER

WHW Engineering, Inc.
1354 East 3300 South, Suite 200
Salt Lake City, Utah 84106
(801) 466-4021
FAX (801) 466-8536

ELECTRICAL ENGINEER

BNA Consulting Engineers
635 South State Street
Salt Lake City, Utah 84111
(801) 532-2196
FAX (801) 532-2305

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SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Owner-furnished products.
 - 4. Use of premises.
 - 5. Owner's occupancy requirements.
 - 6. Work restrictions.
 - 7. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Thayne and Alumni Centers Remodel, Student Center Building
 - 1. Project Location: Salt Lake Community College- Redwood Campus
- B. Owner: State of Utah, Division of Facilities Construction & Management
 - 1. Owner's Representative: Mr. Kurt Baxter
- C. Architect: **HFSArchitects**, 329 South Rio Grande, Salt Lake City, Utah 84101
- D. The Work consists of the following:
 - 1. The Work includes Demolition of existing improvements, metal studs and gypsum board, HM frames and wood veneer solid core doors, finish hardware, glazing, acoustic panel ceilings, rough and finish carpentry, unit masonry, carpeting, painting, mechanical and electrical.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment.
 - 1. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
 - 2. Contractor is responsible for removing, moving, and installing Owner-furnished items at Project site.
 - 3. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
 - 4. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

1.6 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
 - 2. Driveways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1.8 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

- a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
- B. Related Sections include the following:
 - 1. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Project closeout activities.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least **8-1/2 by 11 inches** but no larger than **30 by 42 inches**.
 3. Number of Copies: Submit six opaque copies of each submittal. Architect will return three.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL**1.6 PROJECT MEETINGS**

- A. General: The Architect will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform subcontractors and suppliers and others involved, and individuals whose presence is required, of date and time of each meeting.
 - 2. Minutes: The Architect will record significant discussions and agreements achieved.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for requests for interpretations (RFIs).
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
 - 3. Minutes: Architect will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related requests for interpretations (RFIs).
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Architect will conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Requests for interpretations (RFIs).
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Architect will record and distribute to Contractor the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01330 - SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 2. Division 1 Section "Closeout Procedures" for submitting warranties.
 - 3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals- subject to a "Hold Harmless" agreement.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately **6 by 8 inches** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked "Reviewed, no exceptions taken", or "Furnish as corrected".
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "Reviewed, no exceptions taken", or "Furnish as corrected" taken by Architect.
- 1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES
- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
1. Architect will require a "Hold Harmless" agreement.

PART 2 - PRODUCTS**2.1 ACTION SUBMITTALS**

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 - 4. Submit Product Data before or concurrent with Samples.
 - 5. Number of Copies: Submit five copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.

- h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches** but no larger than **30 by 40 inches**.
 - 3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit five sets of Samples. Architect will retain three Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

- 1. Type of product. Include unique identifier for each product.
- 2. Number and name of room or space.
- 3. Location within room or space.
- 4. Number of Copies: Submit five copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

- a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.

G. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

H. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

- 1. Name, address, and telephone number of entity performing subcontract or supplying products.
- 2. Number and title of related Specification Section(s) covered by subcontract.
- 3. Drawing number and detail references, as appropriate, covered by subcontract.
- 4. Number of Copies: Submit five copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

- a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.

2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit five copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S / ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01731 - CUTTING AND PATCHING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
 - 2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Fire-suppression systems.
 - 2. Mechanical systems piping and ducts.
 - 3. Electrical wiring systems.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
 - 1. Water, moisture, or vapor barriers.
 - 2. Exterior curtain-wall construction.
 - 3. Piping, ductwork, vessels, and equipment.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building or structure.
 - 2. Repair procedures for selective demolition operations.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary" for use of the premises and phasing requirements.
 - 2. Division 1 Section "Work Restrictions" for restrictions on use of the premises due to Owner or tenant occupancy.
 - 3. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
 - 4. Division 15 Sections for demolishing, cutting, patching, or relocating mechanical items.
 - 5. Division 16 Sections for demolishing, cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.
- F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
 1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Matched-veneer woodwork.
 - b. Firestopping.
 - c. Wall covering.
 - d. HVAC enclosures, cabinets, or covers.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.

- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 3. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.

- E. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- G. Temporary Shoring: Provide and maintain interior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
 - 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools

- or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
 10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. Resilient Floor Coverings, Resilient Base and Accessories: Remove floor coverings, base and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

3.6 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 - 1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 01732

SECTION 01770 - CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive **8-1/2-by-11-inch** paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.

- e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01781

SECTION 06105 - MISCELLANEOUS CARPENTRY**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Rooftop equipment bases and support curbs.
- 2. Wood blocking and nailers.
 - a. Provide solid wood blocking at the following location, including, but not limited to: door stops, grab bars, wall mounted toilet partitions and accessories, coat racks, lockers, and two rows at upper cabinets and marker boards.
- 3. Wood furring and grounds.
- 4. Plywood panels.

- B. Related Sections include the following:

- 1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NLGA: National Lumber Grades Authority.
 - 2. WCLIB: West Coast Lumber Inspection Bureau.
 - 3. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood).
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Use Exterior type for exterior locations and where indicated.
 3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 4. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Application: Treat all miscellaneous carpentry, unless otherwise indicated.
 1. Framing for raised platforms.
 2. Concealed blocking.
 3. Roof construction.
 4. Plywood panels.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Furring.
 5. Grounds.
 6. Plywood panels.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.

2.4 PLYWOOD PANELS

- A. Telephone, Electrical Equipment Backing Panels and plywood sheathing for roof construction: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
 - 4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
 - 5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
 - 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.
- G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06105

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Plastic-laminate casework.
 - 3. Shop finishing of woodwork.
 - 4. Cabinetry Hardware and Accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section "Flush Wood Doors" for doors specified by reference to architectural woodwork standards.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.

- D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 - 1. Shop-applied transparent finishes.
 - 2. Plastic laminates.
 - 3. Resin/Stone Composite Surface
- E. Samples for verification of the following:
 - 1. Lumber with or for transparent finish, 50 sq. in., for each species and cut, finished on one side and one edge.
 - 2. Laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
 - 3. Thermoset decorative-overlay surfaced panel products, 8 by 10 inches for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
 - 4. Exposed cabinet hardware, one unit for each type and finish.
- F. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.
- G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.
- B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.
- C. Single-Source Responsibility: Arrange for production of interior architectural woodwork with sequence-matched wood veneers by a single firm.
- D. Quality Standard: Except as otherwise indicated, comply with the following standard:
 - 1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - 2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.
- B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
 - 2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Coordinate cabinet shop drawings and fabrication with hardware requirements as specified in Cabinet Hardware and Accessory Schedule found at the end of this section.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

- B. General: Provide materials that comply with requirements of the WIC quality standard for each type of woodwork and quality grade indicated, unless otherwise indicated.
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: PS 1.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- C. Formaldehyde Emission Level for Medium-Density Fiberboard: Comply with requirements of NPA 9.
- D. Fiberboard: Medium-density fiberboard made without formaldehyde and complying with ANSI A208.2.
 - 1. Product: Subject to compliance with requirements, provide Medite II by Medite Corp.
- E. Particleboard: ANSI A208.1, Grade M-2 made with phenol-formaldehyde resins.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Formica Corporation.
 - b. Nevamar Corp.
 - c. Ralph Wilson Plastics Co.
- G. Adhesive for Bonding Plastic Laminate: Contact cement.

2.2 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."
- B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.
- C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
- E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.
- F. Counter Supports for Bathrooms: Shall be 1-1/4" stainless steel tubing as indicated in construction documents.

2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
 - 1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
- C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
 - 1. Grade: Custom.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of cabinets and edges of solid-wood (lumber) members and rails: **1/16 inch**.
- D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.
- E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 300.
 - 1. Grade: Premium.
- B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- C. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
- D. Wood Species: Red Oak.

2.6 WOOD CABINETS (CASEWORK)

- A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets.
 - 1. Grade: Custom.
- B. AWI Type of Cabinet Construction: Flush overlay.
 - 1. High pressure decorative laminate 0.0500 " thk. With locking vinyl edge
- C. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other than Drawer Bodies: Match species and cut indicated for exposed surfaces.
 - 2. Surfaces Other than Drawer Bodies: Woodwork fabricator's standard cured wet film.
 - 3. Drawer Sides and Backs: 7 or 9 ply ½" Baltic Birch plywood, shop finished.
 - 4. Drawer Bottoms: Tempered Hardwood.

2.7 DRAWERS

- A. Quality Standard: Shall be 7 or 9 ply ½" Baltic Birch plywood, shop finished.
 - 1. Grade: Premium.
- B. Drawer bottoms: Shall be 1/4" Tempered Hardwood.

2.8 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
 - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation.
 - 1. Shop Finishing: To the greatest extent possible, finish architectural woodwork at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.

- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.
- D. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
- E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.
 - 1. Grade: Premium.
 - 2. AWI Finish System TR-6: Catalyzed polyurethane.
 - 3. Staining: None required.
 - 4. Sheen: Satin 30-50 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches for plumb and level (including tops).
- C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Do not use pieces less than 36 inches long, except where necessary. Stagger joints in adjacent and related members. Fill

gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

1. Install standing and running trim with no more than 1/8 inch in 96-inch variation from a straight line.

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

G. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.

H. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

I. Refer to Division 9 Sections for final finishing of installed architectural woodwork.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.5 CABINET HARDWARE AND ACCESSORY SCHEDULE

- A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.
- B. Wall and base cabinets - Concealed (European Type) Hinges: Blum 125 degree Clip Hinges # 77M5550

C. Pulls:

1. Wire Pulls: #DL-110 by Sugatsune America Inc. 221 East Selandia Lane, Carson, CA 90746; 310-329-6373, Fax 310-329-0819

D. Shelf Rests: 5mm Steel Shelf Supports- KV #346 or Blum #34,0040.**E. Drawer Slides: Accuride: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, complying with BHMA A156.9, Grade 1 and rated for the following loads:**

1. Cabinet Drawer Slides: Accuride full extension progressive drawer guide, 150 lb. 417-4005

F. Standards and brackets for store rooms: Knape & Vogt #87 HD standards and #187 HD brackets.**G. Grommets for cable passage through countertops: Doug Mockett, or equal, 3 inch OD , molded-plastic grommets with 2 3/4-inch hole and plastic cap with slot for wire passage. Color selected by architect.****H. Door Locks: Olympus Locks: 7/8" body with 4T key way - 500DR #E07121. Provide locks on all doors or pairs of doors.****I. Drawer Locks: Olympus Locks: 7/8" body with 4T key way - 600DW #E07041. Provide locks on all drawers.**

END OF SECTION 06402

SECTION 07901 - JOINT SEALANTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes joint sealants for the following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
 - a. Joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Perimeter joints of exterior openings where indicated.
 - b. Wall Tile inside corner control joints.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors.
 - d. Perimeter joints of toilet fixtures.
 - e. Other joints as indicated.
 - 4. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Sections for sealing Aluminum Window and Curtainwall joints.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data from manufacturers for each joint sealant product required.

- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- E. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- F. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.7 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after

completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
 - 1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.
- B. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

2.3 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - 2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
 - 3. Any material indicated above.

- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to 26 deg. F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 JOINT FILLERS FOR CONCRETE PAVING

- A. General: Provide joint fillers of thicknesses and widths indicated.
- B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:
 - 1. Asphalt saturated fiberboard.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that

allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 ELASTOMERIC JOINT SEALANT DATA SHEET

- A. Elastomeric Joint Sealant Designation: One part Pourable Urethane Sealant

1. Base Polymer: Urethane.
2. Type: S (single component).
3. Grade: P (pourable).
4. Class: 25.
5. Use Related to Exposure: T (traffic).
6. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated.

- a. Use O Joint Substrates: Galvanized steel, concrete, ceramic tile.

7. Products:

- a. "NR-201 Urexpan", Pecora Corp.
 - b. "Vulkem 45", Memco.
 - c. "Sonolastic SL 1", Sonneborn Building Products Division.

- B. Elastomeric Joint Sealant Designation: Multi-part non-sag urethane sealant

1. Base Polymer: Urethane.
 2. Type: M (Multi component).
 3. Grade: NS (nonsag).
 4. Class: 25.
 5. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.
 6. Use Related to Exposure: NT (nontraffic).
 7. Uses Related to Joint Substrates: M, G, A, and , as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodized aluminum, aluminum coated with a high-performance coating, galvanized steel, ceramic tile.
 8. Products:
 - a. "Dynatrol II", Pecora Corp.
 - b. "Vulkem 922", Mameco.
 - c. "Sonolastic NP2", Sonneborn Building Products Division.
- C. Elastomeric Joint Sealant Designation: One part mildew resistant silicone
1. Base Polymer: Acid-curing silicone.
 2. Type: S (single component).
 3. Grade: NS (nonsag).
 4. Class: 25.
 5. Use Related to Exposure: NT (nontraffic).
 6. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Coated glass, color anodized aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, and ceramic tile.
 7. Products:
 - a. "786 Mildew Resistant", Dow Corning.
 - b. "Sanitary 1700", GE Silicones.
- D. Elastomeric Joint Sealant Designation: Acrylic-Emulsion Sealant
1. Base Polymer: Acrylic -Emulsion Sealant.
 2. Type: S (single component).
 3. Grade: NS (nonsag).
 4. Class: 25.
 5. Use Related to Exposure: NT (nontraffic).
 6. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated
 7. Products:
 - a. "AC-20," Pecora Corp.
 - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
 - c. "Tremco Acrylic Latex 834," Tremco, Inc.

3.7 JOINT SEALANT SCHEDULE

JOINT SEALERS	DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS TYPICALLY APPLIED*.
One-Part Pourable Urethane Sealant	Exterior and interior joints in horizontal surfaces of concrete.
Multi-Part Nonsag Urethane Sealant	Exterior and interior joints in vertical surfaces of concrete; between metal and concrete or mortar; interior and exterior perimeter joints of metal frames in exterior walls; exterior overhead joints.
One-Part Mildew-Resistant Silicone Sealant	Interior joints in vertical surfaces of ceramic tile in toilet rooms, and perimeter of plumbing fixture/ceramic tile joints.
Acrylic-Emulsion Sealant	Interior joints in field-painted vertical and overhead surfaces at perimeter of hollow metal door and window frames; in gypsum drywall, concrete, and concrete masonry; and all other interior joints not indicated otherwise.

END OF SECTION 07901

SECTION 08110 - STEEL DOORS AND FRAMES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes steel doors, frames, and prefabricated revolving darkroom doors.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section "Flush Wood Doors" for hollow-core and solid-core wood doors installed in steel frames.
 - 2. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
 - 3. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- E. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for factory-finished doors and frames.
- F. Samples for verification of each type of exposed finish required, prepared on Samples not less than 3 by 5 inches and of same thickness and material indicated for final unit of Work.

1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Doors and Frames:
 - a. Amweld Building Products, Inc.
 - b. Ceco Door Products.
 - c. Copco Door Co.
 - d. Curries Co.
 - e. Deansteel Manufacturing Co.
 - f. Fenestra Corp.
 - g. Kewanee Corp.
 - h. Mesker Door, Inc.
 - i. Pioneer Industries.
 - j. Steelcraft.
 - k. Republic

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.
- D. Supports and Anchors: Fabricated from not less than 0.0478-inch-thick steel sheet; 0.0516-inch-thick galvanized steel where used with galvanized steel frames.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

- A. Steel Doors: Provide 1-3/4-inch-thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
 - 1. Interior Doors: Grade II, heavy-duty, Model 1, full flush design, 18 gauge steel sheet faces.
 - 2. Exterior Doors: Grade II, heavy-duty, Model 1, full flush design, 16 gauge galvanized steel sheet faces.
- B. Doors shall be "handed"; bevel lock edge 1/8"; hinge mortises shall not be the full depth of the door, and filler plates at hinge mortises are not acceptable.
- C. Provide closed tops on all doors. At exterior doors, top closure must be sealed water tight.

2.4 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of 16 gauge cold-rolled steel sheet, except as noted below.
 - 1. Fabricate frames with mitered or coped and continuously welded corner faces. Weld from back side and grind smooth
 - 2. Fabricate frames for interior openings over 48 inches wide from 14 gauge steel sheet.
 - 3. Form exterior frames from 14 gauge galvanized steel sheet.
- B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide 26 gauge steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior

of openings.

2.5 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
 - 1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Honeycomb core.
 - 2. Clearances: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between non-fire-rated pairs of doors. Not more than 1/2 inch at bottom.
 - a. Fire Doors: Provide clearances according to NFPA 80.
- B. Fabricate exposed faces of doors and panels from only cold-rolled steel sheet.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Fabricate concealed stiffeners, reinforcement, and edge channels from either cold- or hot-rolled steel sheet.
- E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 16 gauge galvanized steel channels, with channel webs placed even with top and bottom edges. Seal top filler water tight.
 - 1. At all exterior locations.
- F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- G. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
- H. Reinforce doors and frames to receive hardware. Provide welded 7 gauge reinforcement for hinges in both frames and doors. Provide welded in place 12 gauge reinforcement for closers in both frames and doors. Drilling and tapping for closers may be done at Project site.
- I. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- J. Glazing Stops: Minimum 20 gauge steel or 0.040-inch- thick aluminum.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

STEEL DOORS AND FRAMES

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 - 2. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
 - 3. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 - 4. Install fire-rated frames according to NFPA 80.
- C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
 - 1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
 - 2. Smoke-Control Doors: Comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08211 - FLUSH WOOD DOORS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS****A.**

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY**A. This Section includes the following:**

1. Solid-core doors with wood-veneer, faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS**A. Product Data:** For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.**B. Shop Drawings:** Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UBC Standard 7-2.
 1. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Buell Door Company.
 - c. Chappell Door Co.
 - d. Eggers Industries; Architectural Door Division.
 - e. GRAHAM Manufacturing Corp.
 - f. Haley Brothers, Inc.
 - g. Ideal Wood Products, Inc.
 - h. IPIK Door Company.
 - i. Mohawk Flush Doors, Inc.
 - j. Oshkosh Architectural Door Co.
 - k. VT Industries Inc.
 - l. Weyerhaeuser Company.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Adhesives: Do not use adhesives containing urea formaldehyde.
- B. Doors for Transparent Finish:
1. Grade: Premium, with Grade AA faces.
 2. Species and Cut: Red oak, plain sliced.
 3. Match between Veneer Leaves: Book match.
 4. Assembly of Veneer Leaves on Door Faces: Balance match.
 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 6. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 20 feet or more.
 7. Stiles: Same species as faces.

2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-2.

- a. Use particleboard made with binder containing no urea-formaldehyde resin.

2. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.

B. Interior Veneer-Faced Doors:

1. Core: Particleboard.
2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:
 - a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch midrail blocking, in doors indicated to have armor plates.
 - d. 4-1/2-by-10-inch lock blocks 5-inch midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.4 LOUVERS AND LIGHT FRAMES

- A. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch-thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

2.5 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: AWI System TR-6 catalyzed polyurethane.
 3. Finish: Manufacturer's standard finish with performance comparable to AWI System TR-6 catalyzed polyurethane .
 4. Staining: As selected by Architect from manufacturer's full range.
 5. Effect: Open-grain finish.
 6. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08711 - DOOR HARDWARE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
- 2. Cylinders for doors specified in other Sections.
- 3. Electrified door hardware.

- B. Related Sections include the following:

- 1. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
- 2. Division 8 Section "Flush Wood Doors" for astragals provided as part of a fire-rated labeled assembly.

- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Details of electrified door hardware, indicating the following:

- 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
- 2. Detail interface between electrified door hardware and fire alarm system.

- C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - 1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.

- G. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Electrified Door Hardware Supplier Qualifications: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
 - a. Engineering Responsibility: Prepare data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
 - 1. Electrified Door Hardware Qualifications: Experienced in providing consulting services for electrified door hardware installations.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
- E. Regulatory Requirements: Comply with provisions of the following:
 - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:

- 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf 67 N to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
 - c. Thresholds: Not more than 1/2 inch high.
 3. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
1. Test Pressure: Test at atmospheric pressure.
- G. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
 - B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- 1.6 COORDINATION
- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices.
- C. WARRANTY
- D. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- E. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- F. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
- G. Warranty Period for Electromagnetic Locks: Five years from date of Substantial Completion.
- H. Warranty Period for Manual Closers: 10 years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.8 EXTRA MATERIALS

- A. Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hardware: one each passage latch sets, keyed lock sets, lock cylinder
 - 2. Electrical Parts: one each magnetic hold open, operator, actuator, strike

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, and the Door Hardware Schedule at the end of Part 3.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products, products equivalent in function and comparable in quality to named products complying with BHMA standard referenced.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
 - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

2.2 HINGES AND PIVOTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hinges:
 - a. Baldwin Hardware Corporation (BH).
 - b. Bommer Industries, Inc. (BI).
 - c. Hagger Companies (HAG).
 - d. Lawrence Brothers, Inc. (LB).
 - e. McKinney Products Company; Div. of ESSEX Industries, Inc. (MCK).
 - f. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
 - g. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- B. Standards: Comply with the following:
 - 1. Butts and Hinges: BHMA A156.1.
 - 2. Template Hinge Dimensions: BHMA A156.7.
- C. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- D. Hinge Weight: Unless otherwise indicated, provide the following:
 - 1. Entrance Doors: Heavy-weight hinges.
 - 2. Doors with Closers: Antifriction-bearing hinges.
 - 3. Interior Doors: Standard-weight hinges.
- E. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 2. Interior Hinges: Steel, with steel pin.
 3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- F. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:.
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - a. Outswinging exterior doors.
 - b. Outswinging corridor doors with locks.
 2. Corners: Square.
- G. Fasteners: Comply with the following:
1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 2. Wood Screws: For wood doors and frames.
 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Mechanical Locks and Latches:
 - a. Schlage (no substitutions- matching existing system)
 2. Electromagnetic Latches:
 - a. Locknetics Security Engineering; a Harrow Company (LSE). (no substitutions- matching existing system)
- B. Standards: Comply with the following:
1. Bored Locks and Latches: BHMA A156.2.
 2. Mortise Locks and Latches: BHMA A156.13.
 3. Interconnected Locks and Latches: BHMA A156.12.
 4. Auxiliary Locks: BHMA A156.5.
 5. Push-Button Combination Locks: BHMA A156.2.
 6. Electromagnetic Locks: BHMA A156.23.
 7. Delayed-Egress Locks: BHMA A156.24.
 8. Exit Locks: BHMA A156.5.
- C. Bored Locks: BHMA Grade 1; Series 4000.

- D. Certified Products: Provide door hardware listed in the following BHMA directories:
 - 1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
- E. Lock Trim: Comply with the following:
 - 1. Lever: Wrought, forged, or cast.
 - 2. Escutcheon (Rose): Wrought, forged, or cast.
 - 3. Dummy Trim: Match lever lock trim and escutcheons.
 - 4. Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
- F. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
 - 1. Bored Locks: BHMA A156.2
- G. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 - 2. Deadbolts: Minimum 1-inch bolt throw.
- H. Rabbeted Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- I. Backset: 2-3/4 inches, unless otherwise indicated.

2.4 ELECTRIFIED LOCKS AND LATCHES

- A. Electromagnetic Locks: Electrically powered locks of strength and configuration indicated; with electromagnet attached to frame and strike plate attached to door. Comply with the following:
 - 1. Strength Ranking: 1500 lbf as tested according to BHMA A156.23.
 - 2. Inductive Kickback: Not more than 53-V peak voltage, as tested according to BHMA A156.23.
 - 3. Residual Magnetism: Not more than 0 lbf to separate door from magnet, as tested according to BHMA A156.23.

2.5 CYLINDERS AND KEYING

- A. Owner will provide ASSA cylinders for locksets.

2.6 STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

2.7 CLOSERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Surface-Mounted Closers:
 - a. LCN Closers; an Ingersoll-Rand Company (LCN). (required to match existing bldg.)
- C. Standards: Comply with the following:
 - 1. Closers: BHMA A156.4.
- D. Surface Closers: BHMA Grade 1
- E. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
- F. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.8 PROTECTIVE TRIM UNITS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metal Protective Trim Units:
 - a. Baldwin Hardware Corporation (BH).
 - b. Hager Companies (HAG).
 - c. Ives: H. B. Ives (IVS).
 - d. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
 - e. Rockwood Manufacturing Company (RM).
 - f. Triangle Brass Manufacturing Company, Inc. (TBM).
- C. Standard: Comply with BHMA A156.6.
- D. Materials: Fabricate protection plates from the following:
 - 1. Stainless Steel: 0.050 inch thick; beveled top and 2 sides.
- E. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.

- F. Furnish protection plates sized 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in Door Hardware Schedule.

2.9 STOPS AND HOLDERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Baldwin Hardware Corporation (BH).
2. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
3. Hager Companies (HAG).
4. Ives: H. B. Ives (IVS).
5. LCN Closers; an Ingersoll-Rand Company (LCN).
6. Norton Door Controls; Div. of Yale Security Inc. (NDC).
7. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
8. Rockwood Manufacturing Company (RM).
9. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
10. Triangle Brass Manufacturing Company, Inc. (TBM).

- B. Standards: Comply with the following:

1. Stops and Bumpers: BHMA A156.16.
2. Mechanical Door Holders: BHMA A156.16.
3. Electromagnetic Door Holders: BHMA A156.15.
4. Combination Overhead Holders and Stops: BHMA A156.8.
5. Door Silencers: BHMA A156.16.

- C. Stops and Bumpers: BHMA Grade 1.

- D. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.

1. Where floor or wall stops are not appropriate, provide overhead holders.

2.10 MISCELLANEOUS DOOR HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Baldwin Hardware Corporation (BH).
2. Hager Companies (HAG).
3. Ives: H. B. Ives (IVS).
4. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
5. Rockwood Manufacturing Company (RM).
6. Triangle Brass Manufacturing Company, Inc. (TBM).

- B. Standard: Comply with the following:

1. Auxiliary Hardware: BHMA A156.16.
2. Exit Alarms: BHMA A156.5.

- C. Auxiliary Hardware: BHMA Grade 1, unless otherwise indicated.

2.11 FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.
1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
 4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
 5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.12 FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 - 1. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 - 2. BHMA 630: Satin stainless steel, over stainless-steel base metal.
 - 3. BHMA 652: Satin chromium plated over nickel, over steel base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with

finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Comply with SLCC system.

D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.

1. Configuration: Provide one power supply for each door opening.
2. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware. Peninsula

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point **3 inches** from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SCHEDULE

NO.	QTY.	ITEM	MFG	MODEL	STYLE/SIZE	FINISH
1		Corridor doors (1-hour rated)				
	3 Ea	Hinges	Hager	AB700	4 ½ "x 4 "	26D
	1 Ea	Lockset	Schlage*	D94PD	Rhodes	26D
	1 Ea	Closer	LCN*	4040	H-Cush	AL
	1 Ea	Kickplate	Quality	No. 48	10"	32D
	1 Ea	Stop	Quality	W302	-----	32D
	1 Set	Smoke Seal	National Guard	2525		
2		Office (non rated)				
	3 Ea	Hinges	Hager	AB700	4 ½ "x 4 "	26D
	1 Ea	Lockset	Schlage*	D50PD	Rhodes	26D
	1 Ea	Stop	Quality	W302	-----	32D
3		Security Doors				
	3 Ea	Hinges	Hager	AB700	4 ½ " x 4 "	26D
	1 Ea	Lockset	Locknetics*	CM5190xDPxM6-Kx06xSLBxATK	Rhodes	26D
	1 Ea	Closer	LCN*	4040	Cush	AL
	1 Ea	Kickplate	Quality	No. 48	10"	32D
	1 Ea	Stop	Quality	W302	-----	32D
	1 Set	Smoke Seal	National Guard	2525		

END OF SECTION 08711

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Interior borrowed lites.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of **12-inch-** square Samples for glass.
 - 1. Each color of tinted float glass.
 - 2. Each type of patterned glass.
 - 3. Wired glass.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Qualification Data: For installers.
- E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- B. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- C. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
- B. Wired Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Quality-Q-6; and of form and mesh pattern specified.

2.3 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.5 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.6 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float-Glass Units: Class 1 (clear) Kind HS (heat-strengthened) float glass Kind FT (fully tempered) float glass.

- 1. Thickness: 6.0 mm.

2.7 MONOLITHIC WIRED-GLASS UNITS

- A. Polished Wired-Glass Units WG-: Form 1 (wired glass, polished both sides), Quality-Q6, Mesh 2 (M2) (Square), 6.0 mm thick.

- 1. Manufacturers:
 - a. Asahi/AMA Glass Corp.; affiliated with AFG Industries, Inc.
 - b. Central Glass Co., Ltd.; distributed by Northwestern Industries Inc.
 - c. Pilkington Sales (North America) Ltd.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than **50 inches** as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide **1/8-inch** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08800

SECTION 09255 - GYPSUM BOARD ASSEMBLIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Nonload-bearing steel framing members for gypsum board assemblies.
 - 2. Repairs to original gypsum board assemblies

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

- C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
 - 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
 - 1. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Framing and Furring:

- a. Consolidated Systems, Inc.
 - b. Dale Industries, Inc.
 - c. Dietrich Industries, Inc.
 - d. Marino/Ware (formerly Marino Industries Corp.).
 - e. National Gypsum Co.; Gold Bond Building Products Division
 - f. Unimast, Inc.
2. Gypsum Board and Related Products:
 - a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.
 - c. Georgia-Pacific Corp.
 - d. National Gypsum Co.; Gold Bond Building Products Division.
 - e. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.
 1. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch thick.
 2. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch diameter.
 - a. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.
 3. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, and as follows:
 - a. Carrying Channels: 2 inches deep, 590 lb/1000 feet, unless otherwise indicated.
 - b. Furring Channels: 3/4 inch deep, 300 lb/1000 feet, unless otherwise indicated.
 - c. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.
 4. Steel Studs for Furring Channels: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - a. Thickness: 20 gage, unless otherwise indicated, except at door jambs where 16 gage is required.
 - b. Depth: 3-5/8 inches and 6 inches unless otherwise indicated.
 - c. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.
 5. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:
 - a. Thickness: 25 gage, unless otherwise indicated.
 - b. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.

2.3 STEEL FRAMING FOR WALLS, PARTITIONS AND SOFFITS

- A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: Manufacturer's standard corrosion-resistant coating.
 2. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - a. Thickness: 20 gage, unless otherwise indicated.
 - b. Thickness: 16 gage, as follows:
 1. For jamb studs at doors and other openings, continue to structure above.
 - c. Depth interior: 3-5/8 and 6 inches at interior, unless otherwise indicated.
 3. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness of base (uncoated) metal as follows:
 - a. Thickness: 25 gage, unless otherwise indicated.
 - b. Depth: 7/8 inch.
 4. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
 - a. Thickness: 0.027 inch unless indicated otherwise.
 6. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches.
 2. Gypsum Wallboard: ASTM C 36 and as follows:
 - a. Type: Regular for vertical surfaces, unless otherwise indicated.
 - b. Type: Type X where required for fire-resistance-rated assemblies.
 - c. Type: Sag-resistant type for ceiling surfaces.
 - d. Edges: Tapered and featured (rounded or beveled) for prefilling.
 - e. Thickness: 5/8 inch, unless otherwise indicated.

2.5 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
 - 1. Material: Formed metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
 - b. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - 1. Cornerbead on outside corners, unless otherwise indicated.
 - 2. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.

2.6 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
 - 1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
 - 1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
 - 2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
 - 3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
 - 4. For topping compound, use sandable formulation.
- D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
 - 1. Ready-Mixed Formulation: Factory-mixed product.
 - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - b. Topping compound formulated for fill (second) and finish (third) coats.
 - c. All-purpose compound formulated for both taping and topping compounds.

2.7 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
 - 1. Steel drill screws complying with ASTM C 1002 for the following applications:
 - a. Fastening gypsum board to steel members less than 0.033 inch thick.
 - 2. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
 - 2. Where partition framing and wall furring abut structure, except at floor.

- a. Install deflection track top runner to attain lateral support and avoid axial loading.
- 3. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch short of full height to provide perimeter relief.
- D. Terminate partition framing 6" above suspended ceilings where indicated.
- E. Install steel studs and furring in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- G. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- H. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Install 2 studs at each jamb, unless otherwise indicated.
 - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
 - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- I. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffer, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffer, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- I. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.

3.6 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
 - 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest

- extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels **vertically** (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
 3. Single-Layer Fastening Methods: Apply gypsum panels to supports with screws.

3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 2. Level 2 where panels form substrates for tile and where indicated.
 3. Level 4 for gypsum board surfaces, unless otherwise indicated.
- E. Use one of the following joint compound combinations as applicable to the finish levels specified:
 1. Embedding and First Coat: Setting-type joint compound. Fill (Second) Coat: Setting-type joint compound. Finish (Third) Coat: Sandable, setting-type joint compound.
 2. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

- F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
- G. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- H. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

3.9 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09255

SECTION 09511 - ACOUSTICAL PANEL CEILINGS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ceilings composed of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.
- D. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. 6-inch- square samples of each acoustical panel type, pattern, and color.
 - 2. Full-size samples of each acoustical panel type, pattern, and color.
 - 3. Set of 12-inch- long samples of exposed suspension system members, including moldings, for each color and system type required.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product test reports from a qualified independent testing agency that are based on its testing of current products for compliance of acoustical panel ceilings and components with requirements.
- G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that show compliance of acoustical panel ceilings and components with the building code in effect for the Project.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, products that may be incorporated in the Work include:

Non-Fire Resistance-Rated, 2' x 4' panels:

USG Eclipse with SLT edge, color white, texture fine, with reveal to simulate 2' x 2' panel, or equal as determined by Architect.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 [plenum mounting in which face of test specimen is 15-3/4 inches away from the test surface] per ASTM E 795.
 2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by reference to ASTM E 1264 pattern designations and not to manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Panel Characteristics: Comply with requirements indicated on each Acoustical Panel Ceiling Product Data Sheet at the end of this Section, including those referencing ASTM E 1264 classifications.

2.3 ACOUSTICAL PANELS

- A. Panel Characteristics: Acoustical panels per ASTM E 1264, with painted finish, complying with pattern and other requirements indicated below:
1. Pattern: Panels matching pattern indicated by reference to manufacturer's standard product designations in "Manufacturers" Article.
 2. Color/Light Reflectance Coefficient: White/LR 0.89
 3. Noise Reduction Coefficient: NRC 0.65-0.75
 4. Ceiling Sound Transmission Class: CSTC 35-39
 5. Edge Detail: Reveal sized to fit flange of exposed suspension system members.
 6. Thickness: 3/4 inch

7. Size: 24 by 48 inches

B. Suspension System Type: As described below and specified in Part 2 "Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems" Article:

1. Wide-face, capped, double-web, steel suspension system, with "step" or "shadow" type edge molding.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch- diameter wire.

D. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.

E. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch wide, formed with 0.0396-inch- thick galvanized-steel sheet complying with ASTM A 446, G 90 (ASTM A 446M, Z 275) Coating Designation, with bolted connections and 5/16-inch- diameter bolts.

G. Sheet-Metal Edge Moldings and Trim: Step or "Shadow" type everywhere formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For lay-in panels, provide stepped-edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.5 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Heavy -duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Cap Material and Finish: Steel sheet painted white.

- B. Available Products: Subject to compliance with requirements, suspension systems that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Wide-Face, Capped, Double-Web, Steel Suspension Systems:
 - a. 1200 System/211-219 Main Tee; Chicago Metallic Corporation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
 - 2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 - 3. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."
 - 4. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."
 - 5. U.B.C. Standard for Ceiling Suspension Systems: U.B.C. Standard No. 47-18.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by

- bracing, countersplaying, or other equally effective means.
3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 7. Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or postinstalled anchors.
 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels with pattern running in one direction parallel to short axis of space.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces

- flush with bottom face of runners.
5. Paint the cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended for this purpose by acoustical panel manufacturer.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Wall Base
- 2. Molding accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than **12 inches** long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F** or more than **90 deg F**.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than **70 deg F** or more than **95 deg F**, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.

2. During installation.
 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than **55 deg F** or more than **95 deg F**.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish not less than **10 linear feet** for every **500 linear feet** or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 RESILIENT WALL BASE

- A. Wall Base: ASTM F 1861.
1. AFCO-USA, American Floor Products Company, Inc
 2. Armstrong World Industries, Inc.
 3. Azrock Commercial Flooring, DOMCO; .
 4. Burke Mercer Flooring Products
 5. Marley Flexco (USA), Inc.
 6. Mondo Rubber International, Inc.
 7. Musson, R. C. Rubber Co.
 8. Nora Rubber Flooring, Freudenberg Building Systems, Inc.
 9. Pirelli Rubber Flooring.
 10. Roppe Corporation.
 11. VPI, LLC, Floor Products Division.>

- B. Type (Material Requirement): TS (rubber, vulcanized thermoset).
- C. Group (Manufacturing Method): I (solid).
- D. Style: Cove (with top-set toe) for vinyl tile and sealed concrete
- E. Style: Straight for carpet tile.
- F. Minimum Thickness: 0.125 inch.
- G. Height: 4 inches.
- H. Lengths: Coils in manufacturer's standard length.
- I. Outside Corners: Job formed.
- J. Inside Corners: Job formed.
- K. Surface: Smooth.

2.4 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet.
 - 1. Burke Mercer Flooring Products.
 - 2. Marley Flexco (USA), Inc.
 - 3. Roppe Corporation.
 - 4. Stoler Industries.
- B. Material: Rubber.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: 50 g/L.
 - b. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 3. Moisture Testing:
 - a. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Apply protective floor polish to accessory surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.

2. Do not move heavy and sharp objects directly over accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09653

SECTION 09681 - CARPET TILE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes modular, carpet tile.
- B. Related Sections include the following:
 - 1. Division 1 Section "Selective Demolition" for removing existing floor coverings.
 - 2. Division 9 Section " Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Existing flooring materials to be removed.
 - 3. Existing flooring materials to remain.
 - 4. Carpet tile type, color, and dye lot.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern of installation.
 - 8. Pattern type, location, and direction.
 - 9. Pile direction.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.

- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 3. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than **10 sq. yd.**.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide one of the following:
1. Interface
 - a. Color: Wheat.
 - b. Pattern: Furrows.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - a. Total VOCs: 10.00 mg/sq. m x h.
 - b. Formaldehyde: 0.05 mg/sq. m x h.
 - c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

PART 3 - EXECUTION

CARPET TILE

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions **1/8 inch** wide or wider and protrusions more than **1/32 inch**, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Free lay; install carpet tiles without adhesive.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09681

SECTION 09900 - PAINTING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed interior items and surfaces.
 - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Unless otherwise noted, do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Finished mechanical and electrical equipment.
 - c. Elevator entrance doors and frames.
 - d. Elevator equipment.
 - e. Light fixtures.
 - f. Distribution cabinets.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Utility tunnels, except for gas pipe, which shall be painted.
 - d. Pipe spaces.
 - e. Duct shafts.

3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Architectural Copper.
 - e. Architectural Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 2. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
 3. Division 8 Section "Steel Frames" for shop priming steel frames.
 4. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
1. After color selection, the Architect will furnish color chips for surfaces to be coated.
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
 3. Submit Samples on the following substrates for the Architect's review of color and texture only:
 - a. Concrete: Provide two 4-inch- square samples for each color and finish.
 - b. Ferrous Metal: Provide two 4-inch- square samples of flat metal and two 8-inch- long samples of solid metal for each color and finish.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. of wall surface.
 - b. Small Areas and Items: The Architect will designate an item or area as required.

2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
3. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.
 - 1. PPG Industries, Inc. (PPG).
 - 2. Pratt & Lambert, Inc. (P & L).
 - 3. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate

size for the surface or item being painted.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
2. Roof Top Units
3. Insulation.
4. Accessory items.

G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished

surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 INTERIOR PAINT SCHEDULE

- A. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:
 - 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a block filler.
 - a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils.
 - 1) PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
 - 2) P & L: Z 98 Pro-Hide Plus Latex Block Filler.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
 - 1) PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
 - 2) P & L: Z/F 4000 Series Accolade Interior Velvet.
- B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 - 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
 - 2) P & L: Z/F 1004 Suprime "4" Interior Latex Wall Primer.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.

- 1) PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
- 2) P & L: Z/F 4000 Series Accolade Interior Velvet.

C. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Semigloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.

- a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

- 1) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
- 2) P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.
- 3) S-W: Kem Kromik Metal Primer B50N2/B50W1.

- b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

- 1) PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
- 2) P & L: S/D 1011 Suprime "11" Interior Alkyd Wood Primer.
- 3) S-W: ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.

- c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.

- 1) PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-Gloss Oil.
- 2) P & L: S/D 5700 Cellu-Tone Alkyd Satin Enamel.
- 3) S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.

END OF SECTION 09900

SECTION 15010 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL:

- A. General Conditions and Division 01 apply to this Division.

1.2 SCOPE:

- A. Includes -
 - 1. Furnish all labor, materials, and equipment necessary for completion of the mechanical work for the
 - 2. Furnish and install all motors specified in this Division and be responsible for the proper operation of electrical powered equipment furnished by this Division.
 - 3. Furnish exact location of electrical connections and information on motor controls to Division 16.
 - 4. Mechanical Contractor shall obtain the services of independent Test and Balance Agency.
 - 5. Placing the air conditioning, heating, ventilating, and exhaust systems into full operation and continuing their operation during each working day of testing and balancing.
 - 6. Making changes in pulleys, belts, and dampers, or adding dampers, as required for the correct balance as recommended by Balancing Contractor at no additional cost to Owner.
 - 7. Air balance, final adjustment and test run.
 - 8. The satisfactory performance of the completed systems is a requirement of this specification.
- B. Related Work Specified Elsewhere -
 - 1. Conduit, line voltage wiring, outlets, and disconnect switches specified in Division 16.
 - 2. Magnetic starters and thermal protective devices (heaters) not a factory mounted integral part of packaged equipment are specified in Division 16.

1.3 SITE INSPECTION:

- A. The Contractor shall examine the site and understand the conditions which may affect the performance of work of this Division before submitting proposals for this work.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine existing site conditions.

1.4 DRAWINGS:

- A. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc; however, locations are to be regarded as shown diagrammatically only. Follow as closely as actual building construction and work of other trades will permit.

- B. Because of the small scale of mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate existing structural and finished conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- C. If changes in location of piping, equipment, ducts, etc. are required due to lack of coordination of work under this division, such changes shall be made without charge. Contractor shall review drawings with local and state agencies having jurisdiction and any changes required by them shall be brought to the attention of the Engineer Architect Contracting Officer prior to bidding or commencement of work.

1.5 CODE REQUIREMENTS, FEES, AND PERMITS:

- A. The work shall be installed in accordance with the following applicable codes, ordinances and standards unless otherwise specified. The codes and standards shall include but not be limited to and be of the latest and current editions.
 - 1. American Boiler and Affiliated Industries (AB and AI)
 - 2. American Gas Association (AGA)
 - 3. Air Movement and Control Association (AMCA)
 - 4. American National Standards Institute (ANSI)
 - 5. Air Conditioning & Refrigeration Institute (ARI)
 - 6. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - 7. American Society of Mechanical Engineers (ASME)
 - 8. American Society of Testing Materials (ASTM)
 - 9. American Standards Association (ASA)
 - 10. American Water Works Association (AWWA)
 - 11. American Welding Society (AWS)
 - 12. Associated Air Balance Council (AABC)
 - 13. Heat Exchange Institute (HEI)
 - 14. Hydraulic Institute (HI)
 - 15. IBR
 - 16. National Electrical Code (NEC)
 - 17. National Fire Protection Association (NFPA)
 - 18. Sheet Metal and Air Conditioning contractors National Association (SMACNA)
 - 19. Underwriters Laboratories (UL)
 - 20. International Building Code (IBC) 2003 Ed
 - 21. International Mechanical Code (IMC) 2003 Ed
 - 22. International Plumbing Code (IPC) with Utah Amendments 2003 Ed
 - 23. Utah State Safety Orders (OSHA/UOSH)
 - 24. Utah Fire Rating Bureau
 - 25. Utah Boiler and Pressure Vessel Law
 - 26. Utah Air Conservation Regulations/Waste Disposal regulations.
 - 27. ASHRAE Ventilation STD.62-2001.
 - 28. International Energy Conservation Code (IECC) 2003 ed.
- B. Should drawings conflict with any code, the code shall govern. If drawings and specifications establish a quality exceeding the code, the drawings and specifications shall govern. If conflicts do exist among the drawings,

specifications and codes, the same shall be brought to the attention of the Engineer Architect Contracting Officer in writing prior to bidding, otherwise Contractor shall comply with applicable codes.

- C. The latest edition of all codes shall be used.
- D. Contractor shall give all notices, obtain all necessary permits, file necessary plans, prepare documents and obtain approvals, and pay all fees required for completion of the mechanical and plumbing work outlined in this Division of the specifications and shown on the Mechanical Drawings.

1.6 OPERATION AND MAINTENANCE MANUAL FOR MECHANICAL SYSTEMS:

- A. Upon completion of work and before final payment, Contractor shall furnish and deliver to the Owner, through the Engineer Architect Contracting Officer, three (3) sets of installation, operating and maintenance manuals and instructions for all new materials and mechanical equipment used in the building.
- B. Bind Operation and Maintenance Manual for Mechanical Systems in a hard-backed piano hinge loose-leaf binder with strong sturdy cover. The following lettering shall be stamped on front and spine of each binder:

OPERATION
AND
MAINTENANCE
MANUAL
for MECHANICAL SYSTEMS of
(Name of Project)
(Location of Project)
(Name of Architect)

- C. The first section is to contain the following information.
 - 1. First page shall be a table of contents including name of project, date awarded and date of substantial completion.
 - 2. Second page shall contain the names, phone numbers and addresses of Architect, Consulting Engineers, and Associates.
 - 3. Third page shall contain a list of names, addresses and phone numbers of contractors and all sub-contractors and work to which each was assigned.
 - 4. Final page or pages shall contain an equipment list. The list shall contain each item of equipment or material for which a submittal was required giving ID or tag no as contained on the drawings make and model No. Serial No. Identification No. Location in building, function and name address and phone number of supplier.
- D. The second section shall contain
 - 1. Description of each operating system included location of switches, breakers thermostats control devices. Provide a single line diagram, showing set points, normal operating parameters for all loads, pressures, temperatures and flow check points; Describe all alarms and cautions for operation.
 - 2. Provide schematic control diagrams, panel diagrams, wiring diagrams etc (blue line prints) for each separate fan system, chilled water system, hot water system, exhaust air system, pumps, etc. each control diagram shall

- show a schematic representation of mechanical equipment and location of start-stop switches, insertion thermostats, thermometers, pressure gauges, automatic valves etc. The correct reading for each control instrument shall be marked on the diagram.
- E. The third section shall contain a comprehensive lubrication list and maintenance schedule for equipment with moving parts. If bearings are sealed equipment shall still be included and a statement to indicate no lubrication or maintenance required.
 - F. The fourth section shall contain a complete air and water test and balance report. The report shall contain name, address and phone number of agency. Name and certification of their mechanical engineer, list of equipment with date of last calibration.
 - 1. Floor plans showing all air openings and thermometer location clearly marked and cross reference with data sheets. Formatted may be 8 1/2 x 11 or 11x14 if legible.
 - 2. Data sheets showing amount of air handled at each setting see section 15960 and 15970.
 - G. The fifth section shall contain data on plumbing fixtures and equipment.
 - 1. Section shall contain general product catalog cuts, approved submittal sheets and exploded view drawings with parts lists for all valves and other items with multiple parts.
 - H. The final sections shall be one for each individual item for which a submittal sheet was required. Each section shall include:
 - 1. Equipment descriptions
 - 2. Detailed installation instruction, operating and maintenance instructions (provided more than just product operations and maintenance instructions provided with unit where required. Instructions should be written in a step by step manner identifying start-up, operating, shutdown and emergency action sequence sufficiently clear so a person unfamiliar with the equipment could perform its operations.
 - 3. Equipment drawings, performance curves, operating characteristics, etc.
 - 4. Name addresses and phone number of manufacturer, fabricator and local vender clearly printed or stamped on cover.
 - 5. Complete parts listing which include catalog number, serial number, contract number or other accurate provision for ordering replacement and spare parts.
 - 6. Certified drawings, where applicable, showing assembly of parts and general dimensions.
 - 7. General product and approved submittal sheets.
 - I. Drawings and reproducible masters of drawings as required in individual specification sections, are not to be bound in volumes but are to be delivered separate with the maintenance manuals.
 - J. Equipment to be covered:
 - 1. Mechanical equipment
 - 2. Plumbing fixtures and equipment.
 - 3. Automatic controls and sensing systems
 - 4. Any item for which a submittal is required.

1.7 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Contractor shall instruct building maintenance personnel in the operation and maintenance of the installed mechanical systems utilizing the Operation and Maintenance Manual when so doing.
- B. Minimum instruction periods shall be as follows -
 - 1. Mechanical - Two hours.
 - 2. Temperature Control - Four hours.
- C. Instruction periods shall occur before final inspection when systems are properly working and before final payment is made.
- D. None of these instructional periods shall overlap each other.
- E. An additional two hours of instruction will be provided by each contractor, after 60 days of system operation by owner to insure proper system operation and answer questions.

1.8 RECORD DRAWINGS:

- A. Contractor shall keep an up-to-date set of mechanical and plumbing drawings in his custody showing all changes in red, clearly defined and neatly drafted by him. At the end of construction, he shall turn these drawings over to the Engineer Architect Contracting Officer. Record drawings must be completed and submitted prior to final inspection.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 15010

SECTION 15051 - BASIC MATERIALS & METHODS GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL:

- A. Division 15010 General applies to this Section.

1.2 COORDINATION OF WORK:

- A. It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for the installation of systems according to the true intent and meaning of the Contract Documents. Anything not clear or in conflict will be explained by making application to the Architect in writing. Should conditions arise where certain changes would be advisable, secure Owner's and Architect's approval for these changes before proceeding with work.
- B. Coordinate work of various trades in installing interrelated work. Before installation of mechanical items, make proper provision to avoid interferences in a manner approved by Architect. Changes required in work specified in Division 15 caused by neglect to secure approval shall be made at no cost to Owner.
- C. Arrange piping, ductwork, and equipment to permit ready access to valves, unions, starters, motors, control components, and to clear openings of doors and access panels. Contractor shall provide all necessary access doors and/or panels to provide complete access to all mechanical equipment, dampers, or accessories. Doors for dampers, etc. shall be minimum 12" x 12" and doors for mechanical equipment shall be minimum 24" x 24".
- D. Furnish and install inserts and supports required by Division 15 unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions involved in sufficient time to be built into the construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by Contractor.
- E. Be responsible for required digging, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Owner and Architect. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
 - 1. Patch and repair walls, floors and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
 - 2. This Division shall bear expense of cutting, patching, repairing, and replacing of work of other Divisions because of its fault, error, tardiness, or because of damage done by it.
- F. Adjust locations of piping, ductwork, equipment, etc. to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and cut prior to fabrication.
 - 1. Make offsets, transitions, and changes in direction of piping, ductwork, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
- G. Slots and openings through floors, walls and roofs shall be provided by this Division.

- H. This Contractor shall schedule his work, store his equipment and materials, and work in harmony with other Contractors so as to not delay or jeopardize the construction.
- I. This Division shall coordinate with electrical contractor to insure that all required components of control work are included and fully understood. Any discrepancies shall be called to the attention of the Architect before completion of bids. No additional cost shall accrue to the Owner as a result of lack of such coordination.

1.3 EQUIPMENT & MATERIALS:

- A. Requests for substitution shall be received in writing a minimum of seven days prior to bidding. Prior acceptance shall be by Manufacturer's name only. Items not listed in this specification or subsequent addendums shall not be considered. No oral approvals will be acceptable. Manufacturers listed in this specification are acceptable only for items listed. All other items manufacturer wishes to bid must be prior approved. All equipment shall be subject to final review in accordance with "Project Submittals".
- B. Product Approvals -
 - 1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
 - 2. In the event other than specified equipment is used and will not fit job site conditions, this Division assumes responsibility for replacement with items named in Specification.
- C. Use domestic made pipe, pipe fittings, and motors on Project.
- D. Motor and equipment name plates as well as applicable UL labels shall be in place when Project is turned over to Owner.
- E. Insure that items to be furnished fit spaces available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. Do not scale off drawings.
- F. All materials shall be of the best commercial quality obtainable, consistent with specified materials and for the purpose or function intended. Materials shall be new unless specifically excepted.
- G. Equipment catalog or model numbers shown define the basic equipment types and quality standard only. Catalog numbers shall not be considered as all inclusive and shall be verified to include all devices, controls, operators, and appurtenances necessary for the satisfactory and complete operation of the equipment.
- H. Follow manufacturer's directions in delivery, storage, protection, and installation of equipment and materials.
 - 1. Promptly notify Architect in writing of conflicts between requirements of Contract Documents and Manufacturer's directions and obtain Architect's written instructions before proceeding with work. Contractor shall bear all expenses arising from correcting deficiencies of work that does not comply with Manufacturer's directions or such written instructions from.
- I. Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.

1.4 PROJECT SUBMITTALS:

- A. Furnish complete catalog data for manufactured items of equipment to be used in the Work to for review within 15 days after award of Contract.
- B. Submittal shall include, but not be limited to the following:
 - 1. equipment scheduled
 - 2. balancing contractor
 - 3. insulation
 - 4. grilles, and diffusers
 - 5. automatic temperature controls
 - 6. certificates of guarantee
 - 7. valves
 - 8. plumbing fixtures, accessories, and specialties
 - 9. any item for which more than one manufacturer is mentioned
- C. Submit a minimum of five copies of data in binders and index in same order and name as they appear in Specification.
 - 1. State sizes, capacities, brand names, motor HP, electrical requirements, accessories, materials, gauges, dimensions, and other pertinent information.
 - 2. List on catalog covers page numbers of submitted items.
 - 3. Underline or highlight applicable data.
- D. If material or equipment is not as specified or submittal is not complete, it will be rejected.
- E. Catalog data or shop drawings for equipment which are noted as being reviewed by shall not supercede Contract Documents.
- F. Review comments of shall not relieve this Division from responsibility for deviations from Contract Documents unless attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- G. Check work described by catalog data with Contract Documents for deviations and errors.
- H. All items other than first named specified equipment shall show and state all exceptions and deviations taken and shall include design calculations and drawing layouts.
- I. The Contractor shall review the submittals prior to submission to the to make sure that the submittals are complete in all details. No submittal will be reviewed which does not bear the contractor's notation that such checking has been made.
- J. No partial submittals will be considered unless approved by the
- K. Manufacturers' names shall be mentioned as acceptable prior to bidding.
- L. Contractor shall verify equipment dimensions to fit the spaces provided with sufficient clearance for servicing the equipment.
- M. Contractor shall review equipment submittals for compliance with schedules, specifications, and drawing plans and details. Equipment submittal shall show the proper arrangements to suit installation and maintenance such as motor location, access doors, filter removal, piping connections, etc.
- N. Equipment submittal sheets shall be clearly marked indicating equipment symbol and exact selection of proposed equipment. Submittals shall clearly indicate name of manufacturer of each item.
- O. For unacceptable items, the right shall be reserved to require the first named specified items.

- P. Where submittals are sent to with any of the above listed information missing or are incomplete they will be returned to the contractor unchecked to be completed and resubmitted. No additional time or money shall be allowed for failure to provide complete submittals on the first review.
- Q. If an item requiring submittal review is ordered, purchased, shipped, or installed prior to the submittal review and is subsequently disapproved the item shall be removed from the job site and replaced with an approved item at contractors expense.

1.5 CLEANING & FINISHING:

- A. Contractor shall, at all times, keep the premises free from waste material and rubbish. Upon completion of this Section of the work, Contractor shall remove all surplus materials and rubbish; clean all spots resulting from the mechanical work from hardware, floors, glass, walls, etc.; do all required patching up and repair all work of other trades damaged by Contractor under this Section of the work, and leave the premises in a clean orderly condition. Clean heating and cooling coils, internally and externally, and replace all air filters prior to final mechanical inspection. Remove rust, plaster, dirt, grease and oil before painting, insulating, or exposing to view the equipment, piping, ductwork, etc. in completed structure. Refinish any damaged surfaces and leave in proper working order at final completion.

1.6 EQUIPMENT SERVICING:

- A. Prior to starting mechanical equipment, all motors, bearings and moving parts shall be properly oiled, greased and lubricated as required. Full and adequate maintenance service shall be given and upon completion all equipment shall be cleaned and checked and placed in perfect condition for the Owner.
- B. Provide lubrication for the following:
 - 1. Damper motors
 - 2. VAV boxes
- C. Amount and type of lubricant shall be per manufacturer's specification.

1.7 SUPERVISION:

- A. The Contractor shall supervise and direct the work with his best skill and attention. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor will be responsible to see that the finished work complies accurately with the Contract Documents.

1.8 SAFETY REGULATIONS:

- A. Contractor shall provide equipment, supervision, construction, procedures, and everything necessary to assure safety of life or property.
- B. Refer also to General Condition and Special Conditions for protection clauses.

1.9 LEAK DAMAGE:

- A. Contractor shall be responsible for damages to the work of other Contractors or to the building, or to its contents, people, etc., caused by leaks in any of the

equipment or piping installed by him through equipment or material failures, leaking joints or disconnected pipes, fittings, or by overflows and shall make at his own expense all repairs to fixtures, building interior, contents, paint, rugs, furniture, ceiling tile, and equipment so damaged.

1.10 TOOLS AND STORAGE OF EQUIPMENT:

- A. The Contractor shall furnish all necessary tools, staging and whatever may be necessary for the installation of this work and shall at all times protect this work and others, and the materials to be used therein from damage by the weather, accident and other causes, and shall repair and make good any damage thus occurring.

1.11 WORKMANSHIP:

- A. Workmanship shall be the best quality of its kind for respective industries, trades, crafts and practices and shall be acceptable in every respect to the Owner and Engineer. Nothing contained herein shall relieve the Contractor from performing good work, perfect in all details of construction.

1.12 BELT GUARDS:

- A. Shall be provided, properly enclosing each belt drive system. Guards shall be easily removable, constructed of expanded metal with suitable frames corresponding with SMACNA standard and with tachometer openings. Coordinate with equipment suppliers to avoid duplication of belt guards supplied with equipment. Guards shall comply with OSHA Regulations.

1.13 ELECTRICAL WORK:

- A. Power wiring to all electrically driven apparatus shall be done under the electrical contract. See Electrical Specifications.
- B. Unless specifically noted otherwise on documents, Electrical Contractor shall furnish and install all magnetic starters including properly sized heaters, and disconnect switches as indicated on drawings or required by code.
- C. The Contractor shall verify the proper operation of equipment furnished by him. Costs for repair, replacing, re-wiring and retesting shall be borne by the Contractor without additional costs to the Owner.
- D. Motors shall be as specified in Section 15055.

1.14 CONTRACTOR'S USE OF BUILDING EQUIPMENT:

- A. The Contractor may use equipment such as electric motors, fans, filters, etc. when permanently installed as part of the project and with the written permission of the Owner. As each piece of equipment is used, maintenance procedures approved by the manufacturer shall be followed, a careful record shall be kept of the time used, maintenance procedure following and of any difficulty experienced with equipment. The Contractor's records on the equipment shall be submitted to the Owner upon acceptance of project. All fan belts and filter media shall be new at the beginning of the Mechanical System Operating Test Run and System

Balancing. Wearing surfaces (such as bearings) shall be carefully inspected just prior to acceptance. Any excessive wear noted shall require replacement.

1.15 INSPECTION NOTICE:

- A. The following is a basic list of guideline items so that the Architect, district building inspector/Owner's representative can be at job site for these inspections as the building progresses. Mechanical Contractor shall inform these people one week in advance of test time.
 - 1. Water tests on all sewer, waste, and rainwater piping prior to piping being concealed.
 - 2. Pressure tests on all water service piping.
 - 3. Pressure tests on hot, chilled, and condenser water supply and return piping.
 - 4. All duct work prior to installation of finished ceilings, including ductwork pressure testing.
 - 5. The initial start-up of mechanical equipment, etc.
 - 6. Any changes or problems occurring at job site.
 - 7. Inspect all vent flashings on roof prior to roofing.
 - 8. Periodic inspection at their discretion will be made to insure compliance to Contract Documents and codes. Contractor shall provide ladders, access and other assistance as requested during inspections.
 - 9. Control piping pressure tests.
 - 10. Final inspection before giving approval for final payment.

1.16 WARRANTY GUARANTEE:

- A. The Contractor shall warrant all materials and equipment to be of quality consistent with specifications as represented by manufacturer's published data.
- B. The Contractor shall guarantee that the installation and operation of the equipment shall be free from defects for a period of one year beginning at date of substantial completion and acceptance. The Contractor shall replace or repair any part of the installation that is found to be defective or incomplete within the guarantee period.
- C. The one year guarantee on equipment and systems shall commence when equipment has been demonstrated to work and has been accepted. (Example: If an equipment item fails to perform and it takes 9 months after substantial completion to correct, then the guarantee shall commence after the item has been demonstrated to perform and has been accepted.)
- D. Substantial completion and acceptance in no way relieves the Contractor from providing the systems and equipment as specified.

1.17 COMPLETION SCHEDULE:

- A. Start-up and verification of basic equipment items shall be done prior to the date of substantial completion with sufficient time to allow balancing and adjusting to be performed.
- B. At the time of the final inspection a date shall be agreed upon for completion of any remaining items. At least double the estimated cost of the work will be withheld from the Contractor's payment.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 15051

SECTION 15075 - PIPE AND EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE:

- A. Piping Identification
 - 1. All pipes shall be labeled and color coded with contents clearly identified and arrows indicating direction of flow. This applies to piping run above the ceilings as well as pipe exposed in equipment rooms and finished areas. Pipes shall be identified at the following locations:
 - a. Adjacent to each valve.
 - b. At every point of entry and exit where piping passes through a wall or floor.
 - c. On each riser and junction.
 - d. A maximum of every 50 feet on long continuous lines fully exposed to view. Less spacing if one cannot see one code from the adjacent.
 - e. Adjacent to all special fittings or devices (regulating valves, etc..
 - f. Connection to equipment.
- B. Duct Identification
 - 1. Ductwork shall be identified at or near the fan.
- C. Equipment Identification
 - 1. Identify all equipment including gauges, meters, thermostats, mechanical equipment, ATC panels, junction boxes, and all other devices.

PART 2 - MATERIALS

2.1 PIPING IDENTIFICATION:

- A. Labels and markers shall be of the self-sticking, all-temperature permanent type as manufactured by W. H. Brady Co., 727 West Glendale Ave., Milwaukee, Wisconsin; or Seton Name Plate Corp., 592 Boulevard, New Haven, Connecticut.
- B. Pipe color coding shall be uniform throughout the building and comply with requirements of ANSI A13.1.
- C. All paint to be Enamel, Moore Impervo and Iron Clad.
- D. Letters of identification legend and directional flow arrows shall be 2" high for pipes 3" and larger, and 1" high for pipes 2-1/2" and under.
- E. Proposed identification system shall be approved by Owner and Architect prior to installation.

2.2 DUCT IDENTIFICATION:

- A. Ductwork shall be identified at or near the fan, with stenciled signs or by engraved laminated plastic signs secured with rust proof screws. Sign shall indicate area served and direction of air flow.

2.3 EQUIPMENT IDENTIFICATION:

- A. Equipment shall be identified with signs made of laminated plastic with 1/8" or larger engraved letters. Signs shall be securely attached by rust proof screws or

- some other permanent means (no adhesives).
- B. Information on signs shall include name of equipment, identification on plans and schedules, rating maintenance instructions and any other important data not included on factory attached name plate.

PART 3 - EXECUTION

3.1 PIPING IDENTIFICATION:

- A. Markers shall be installed in strict accordance with manufacturer's instructions. Use vinyl tape first and stick markers over tape. This procedure assures that the tape will not fall off.
- B. On chalky and loose insulation, soft, porous, fiber-filled or fiberglass covering, a spiral wrap of pipe banding tape shall be made around the circumference of the pipe. Sufficient spiral wraps shall be made to accommodate the horizontal dimension of the pipe marker.
- C. On bare pipes, painted pipes, and pipes insulated with a firm covering pipe banding tape matching the background color of the marker shall be used. After applying pipe markers, wrap pipe banding tape around pipe at each end of marker. Tape should cover 1/4" to 1/2" to 1" on itself. Be sure pipe surface is dry and free of dirt or grease before applying markers or banding tape.
- D. Stenciling may be used in lieu of the above labels and markers if finished application gives the same overall appearance, that is that stenciling is applied over a background color. If stenciling is used, letter heights, background colors, banding and arrows shall be as specified above. Submit sample to Owner before proceeding with work.
- E. Apply markers so they can be read from floor.

3.2 DUCT IDENTIFICATION:

- A. Identify all ducts exposed in mechanical equipment room. A sample duct identification is as follows: Supply Air VAV System Administration Offices.

3.2 EQUIPMENT IDENTIFICATION:

- A. Signs shall be attached to equipment so they can be easily read. Attachment shall be by screws or rivets. Glue shall not be used.
- B. A sample identification sign for equipment shall be as follows: AH-1 Air handler single zone Gymnasium 8000 cfm.
- C. NOTE: Avoid using only the engineers designations as used on plans; identify equipment as to area or zone served.

3.3 REMOVABLE AND NON-REMOVABLE CEILING TILE:

- A. Where valves, VAV boxes, fire dampers, adjustment controls, etc. are located above ceiling tile, identification on the lay in tile tee bar shall be provided to indicate the tile to be removed for access to a particular item. In general, 1/2 inch high black stick on or stencil letters are to be used indicating the device such as VAV for VAV box, CWV for cold water valve, FD for fire damper, E for other electrical devices, etc. The code used shall be provided in the operations and maintenance manual.

- B. For non-accessible ceiling and ceilings without tee bars, provide hinged access doors at each valve, fire damper, damper operator and VAV box.

END OF SECTION 15075

SECTION 15081 - DUCT INSULATION

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Insulation of concealed round above grade supply air ducts that are not lined. All ductwork routed outside of building insulation envelope.
 - 2. Insulation shall have surface burning characteristics as determined by ASTM E84 with a flame spread rating of 25 and a smoke developed of 50.
- B. Related work specified elsewhere -
 - 1. Acoustical insulation inside air ducts is specified in Section 15822.
 - 2. Insulated flex duct specified in Section 15818.

PART 2 - PRODUCTS

2.1 INSULATION:

- A. 1-1/2 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of one lb/cu ft.
- B. Approved Manufacturers:
 - 1. Johns-Manville Microlite FSK
 - 2. CSG Type IV standard duct insulation
 - 3. Owens-Corning FRK-25
 - 4. Knauf (Duct Wrap FSK)

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install duct wrap in accordance with Manufacturer's recommendations.
- B. Do not compress insulation except in areas of structural interference.
- C. Joints shall be completely sealed.

END OF SECTION 15081

SECTION 15088 - HEATING HOT WATER PIPE INSULATION

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Insulation of heating hot water supply and return piping and fittings and valves.

PART 2 - PRODUCTS

1.2 INSULATION:

- A. Snap-on glass fiber pipe insulation with surface burning characteristics as determined by ASTM E84 with a flame spread rating not to exceed 25 and smoke developed not to exceed 50 when tested to UBC Standards.
- B. Concealed areas; fiberglass sectional pipe insulation with ASJ jacketing.
- C. Exposed areas; Owens-Corning Fiberglass 25; H-P pipe insulation with pre-sized glass cloth cover.
- D. Approved Manufacturers -
 - 1. Owens-Corning
 - 2. Johns-Manville
 - 3. CSG
 - 4. Knauf
- E. Thickness shall be as noted in table 2.

1.3 COVERING:

- A. Where piping is susceptible to damage, provide with heavy duty PVC jacket.
 - 1. Jacket material shall be a minimum of .030 inches thick and white in color unless directed otherwise by Architect.
 - a. Approved Manufacturers
 - 1) Ceel-Tite 320 by Ceel Co.
 - 2) Prior approved equal

PART 3 - EXECUTION

3.1 PIPING:

- A. General
 - 1. Pipe insulation shall be continuous through the sleeve.
 - 2. A PVC jacket shall be provided over the insulation wherever caulking is required.
 - 3. Insulation shall be continuous through hangers.
 - 4. Support points such as hangers or rollers shall have a calcium silicate block at support point. See section 15101.
 - 5. Insulation shall be applied to clean, dry pipe with joints tightly butted.
 - 6. Longitudinal laps of the jacket material shall overlap not less than 1-1/2 inches, and butt strips 3 inches wide shall be provided for circumferential joints.

7. Laps and butt strips shall be secured with adhesive and stapled on 4-inch centers. Adhesive may be omitted where pipe is concealed.
8. Breaks and punctures in the jacket material shall be patched by wrapping a strip of jacket material around the pipe and cementing, stapling, and coating as noted for butt strips. Patch shall extend not less than 1-1/2 inches past the break.
9. The run of the line pipe insulation shall have the ends brought up to the item.

3.2 FITTINGS:

- A. Insulate fittings with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in or Tapered.
- B. Cover insulation with one piece "Zeston" PVC fitting cover or equal by Ceel Co. secured by stapling or taping ends to adjacent pipe covering.
- C. Alternate Method -
 1. Insulate fittings with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending two inches onto adjacent insulation.

TABLE 2

Thickness of Pipe Insulation for Heating Hot Water Piping

Pipe Size	1" and less	1-1/4" to 2"	2-1/2" to 4"
Thickness	1"	1"	1-1/2"

NOTE: PIPING ROUTED OUTSIDE OF BUILDING INSULATION ENVELOPE SHALL HAVE INSULATION THICKNESS INCREASED 1/2"

END OF SECTION 15088

SECTION 15101 - PIPE AND PIPE FITTINGS

PART 1 – GENERAL

1.1 RELATED SECTIONS:

- A. Division 15010 General applies to this Section.

1.2 SCOPE:

- A. Includes -
 - 1. General piping installation, materials and procedures for all piping systems.
- B. Related Work Specified Elsewhere -
 - 1. Type of pipe and fittings for heating hot water shall be specified in that particular Section.

PART 2 - PRODUCTS

2.1 HANGERS:

- A. Provide one of the following types of hangers for horizontal piping. Comparable products of Grinnell, Globe Pipehanger, B-Line, Michigan Hanger, Superstrut or Piping Technology and Products (PTP) considered equal.
- B. Except as otherwise specified hereinafter: Clevis type, B-Line Fig. B3100.
- C. Where pipe exceeds maximum loading recommended for Clevis type Hangers, provide steel pipe clamp, B-Line Fig. B3140 or Fig. B3142, depending on loading.
- D. Provide trapeze hangers where several pipes can be installed parallel and at the same level. Trapeze hangers shall consist of 2 steel channels bolted back to back spaced for rod hangers at each end. Use roller chairs B-Line B3120 pipe roll stands B-Line B3117 SL where provision for expansion is required.
- E. Supporting rods shall be attached to concrete by inserts placed before concrete is poured for pipes up to 8 inches.
- F. Supporting rods over 18 inches long shall be braced at every fourth hanger with diagonal bracing attached to slab or beam.
- G. Spring hangers shall be used for support of pipe within 100 diameters distance of coils, or pumps, as needed to isolate vibration. Springs shall be sized 1" static deflection. Vibrex type HXAP-PC adjustable spring hangers.
- H. For copper tubing use copper hanger; or dielectrically isolate.

2.2 WALL SUPPORTS:

- A. Provide one of the following means of supporting horizontal piping from wall:
- B. B-Line B-200 pipe clamp.
- C. For hanger suspension, 750 pound maximum loading, light welded steel bracket with hole for one rod, 3/4 inch diameter. B-Line Fig. B3068.
- D. For pipe roll stand support, welded-steel bracket, light for 700 pound maximum loading, B-Line Fig. B3063, medium for 1500 pound maximum loading Fig. B, heavy for 3000 pound maximum loading Fig. B3067.

2.3 CLAMPS:

- A. Beam clamps shall be malleable iron, B-Line Fig. B442 for 1/4 inch hanger rods; forged steel beam clamp, B-Line B321 for hanger rod up to 1-1/2 inches.

2.4 PIPE COVERING PROTECTION:

- A. Provide calcium silicate blocks in the bottom 1/2 diameter of pipe to protect insulation at areas of contact with hangers and supports. Material shall be 8 inches long for pipes up to 3 inches and 12 inches long for pipes 3-1/2 inches and larger. Insulation manufacturer supplied inserts shall be acceptable.

2.5 WALL AND CEILING PLATES:

- A. Fit pipes passing through walls, floors, and ceiling with wall plates of proper size to cover openings around pipes. Plates will not be required at floor slabs where sleeves project above floor and space between pipe and sleeve is caulked and sealed. Plates shall be equal to Beaton and Cadwell No. 10, pressed steel plates. Floor plates shall be chromium plated. Wall and ceiling plates shall be prime coated.

2.6 UNIONS AND COUPLINGS:

- A. Unions: Malleable iron, brass to iron seat, ground joint, same materials as pipe. Crane, Walworth, or approved equal.
- B. Dielectric Unions: Mechanical Contractor shall install dielectric union or couplings whenever copper pipe connects to steel pipe or other items of equipment. Couplings and unions shall be as manufactured by the Water Vallot Company of Detroit, Michigan, or approved equal.

2.7 PIPING SPECIALTIES:

- A. Provide thermometers, pressure gages, vents, tank fittings, and other miscellaneous piping specialties as shown or as may be required by usual good practices for a complete system.
- B. Thermometers shall be 9" scale, red reading, glass covered, immersion type with separable sockets. Marshall-Town, Moeller, Trerice, Weskler, or Weiss, with neck extension to accommodate insulation.
- C. Pressure gages shall be 4-1/2" diameter dial, molded case dust proof, phosphor bronze, bourdon tube type installed with integral check screw or pressure snubber. Marshalltown 224, U.S., Ashcroft, Trerice or Marsh.
- D. Manual air vents shall be installed at all high points in piping system and drain valves at system low points. Manual air vents shall be 3/8" globe valves on 6" long pipe nipple with 1/4" copper tubing to near floor. Drain valves shall be fitted for 3/4" hose connection with vacuum breaker. Provide access for valves.

2.8 STRAINERS:

- A. Walworth 3699 - 1/2 Sarco SB; bronze, smaller than 2-1/2 inches. Bailey 125 pound No. 100; Zurn 125 pound No. 540 FPS; or Crane No. 989-1/2, cast iron 2-1/2 inches and larger or equal by Metraflex. Water straining element shall be

perforated 20 mesh monel screen. Strainers shall be designed for the same working pressure as the control valves. Provide strainer blowoff port with line size hose bibb and vacuum breakers.

2.9 VALVES:

- A. Provide on each valve a name plate showing manufacturer, valve size, grade, and pressure temperature service rating.
- B. See specific piping system sections for valves to be used in that system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **All drainage of existing piping and new fill including chemical treatment shall be the responsibility of this contractor.** Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
- B. Properly support piping and make adequate provision for expansion, contraction, slope, and anchorage.
 - 1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
 - 2. Do not use pipe hooks, chains, or perforated metal for pipe support.
 - 3. Remove burr and cutting slag from pipes.
- C. Piping shall not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.
- D. Make connections of dissimilar metals with insulating couplings.
- E. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.
 - 1. Seal sleeves with plastic or other acceptable material.
 - 2. All piping passing through floors and outside walls and foundations shall have a water tight sleeve and water tight caulking around pipe. Extend pipe sleeve minimum of 3 inch above floor.
- F. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of systems. Do not use plugs of rags, wool, cotton waste, or similar materials.
- G. Install piping systems so they may be easily drained.
- H. Do not place water piping within building perimeter in contact with earth.
- I. Valves of same type shall be of same Manufacturer.
- J. Do not use reducing bushings, street elbows, or close nipples.
- K. Make changes in direction with proper fittings. Bending of pipe is not approved.
- L. Hanger rods shall be of a diameter adequate to support pipe size.
- M. Install additional supports as required.
- N. Suspend all piping in building except that underground. Laying of piping on any building member is not allowed.
- O. Design all hangers to support the required loads. Where necessary, supports shall be designed to permit movement due to expansion and contraction. Where drawings show details of supports and anchors, conform to details shown.

Where details are not shown, conform to General Requirements specified in sub-paragraph.

- P. Horizontal Piping Support Schedule: Support horizontal piping of steel, cast iron, plastic, and copper as follows:

HORIZONTAL PIPING SUPPORT SCHEDULE

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	8'-0"
1-1/2" and 2"	3/8"	10'-0"
2-1/2" and 3"	1/2"	10'-0"
4" and up	5/8"	12'-0"

- Q. Piping with nonpressure type joints such as Soil and Waste Piping shall be supported with a minimum of two hangers per pipe section.
- R. Support horizontal lines of copper tubing with hangers. Space not more than 8 feet center to center.
- S. Cutting or other weakening of the building structure to facilitate installation will not be permitted. The Contractor shall demonstrate that no weight or stress is placed upon the equipment by the piping and that piping and connection of equipment are in perfect alignment. When so directed, disconnection and reconnection of piping shall be done by Contractor for designated pipe section to properly demonstrate stress; this shall be at no cost to Owner.
- T. Flanges or unions as applicable for the type of piping specified shall be provided in the piping at connections to all items of equipment. All piping shall be installed to insure noiseless circulation. All valves and specialties shall be placed, packed and adjusted at the completion of the work before final acceptance.
- U. Operating Valves shall be accessible for operation from floors or platforms where feasible, and handwheels shall not be more than 4'-6" above the floor or platform. In other cases, valves and cocks shall be equipped with chain operated handwheels or extension stems, or other suitable means of remote control.
1. Tighten glands and add additional gland packing as required before final inspection.
- V. Provide sufficient clearance for insulated piping and fittings to permit application of insulation without cutting either pipe line covering or fitting coverings.

3.2 PIPE PROTECTION:

- A. Do not run piping in outside wall, or where freezing may occur. Piping in attic spaces shall be run on the interior side of building insulation.
- B. No water piping in building shall be in contact with earth.
- C. All piping as installed shall be plugged or capped until equipment has been permanently connected.

3.3 GRADE AND DRAINAGE:

- A. All piping shall be erected to insure proper draining. Grade soil, waste, and drainage lines not less than 1/4" per foot unless noted otherwise on drawings. Grade rain water lines minimum 1/8" per foot.
- B. Heating water, chilled water, condenser water and domestic hot and cold water lines shall be graded so as to drain system with as few drains as possible. Drains shall be located in convenient and accessible places. All drainage piping shall extend to floor drains.

3.4 FLEXIBLE CONNECTIONS:

- A. Shall be provided wherever pipe connects to motor operated equipment.

3.5 DIELECTRIC FITTINGS:

- A. Shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

3.6 PIPE JOINTING:

- A. All steel pipe shall be joined by flanged, or screwed connections or by welding. Where welding is employed, welding type fittings with beveled ends shall be used. The mitering of pipes to form elbows and the notching of straight runs to form tees will not be allowed. All galvanized pipe shall be screwed. Copper pipe shall be soldered. All piping shall be cut to length by hack-saw or pipe cutter. Cutting of pipe with a torch will not be allowed.
- B. Threaded Piping:
 - 1. Threading shall be American-Standard taper pipe threads. Ream pipe ends and remove burrs after threading. Limit number of threads so that not more than two (2) threads will show beyond fitting.
 - 2. All pipe joints shall be properly sealed with thread coatings applied to the male thread. Sealer for culinary water piping shall be Teflon tape. Sealer for steel pipe in heating, waste and vent lines shall be powdered graphite and Linseed oil or plumage and linseed oil or "Type-Unyte", or Teflon tape.
- C. Soldered Piping:
 - 1. Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for sweated fittings shall be made with a non-corrosive paste flux and solid wire solder. Use 95-5 or 96-4 Tin-Antimony solder. Cored solder will not be permitted.
- D. Welding:
 - 1. Welders shall be certified-
 - a. Welders shall be certified and shall bear evidence of certification within 30 days prior to commencing work on this project.
 - b. If there is any doubt as to the proficiency of the welder, the Owner may require the welder to take another test. This shall be done at no additional expense to the Owner.

- c. Welders shall be certified in accordance with section IX of the ASME Boiler and Pressure Vessel Code by Pittsburgh Testing Laboratories or other Testing Agency acceptable to the Owner.
2. Piping 2" and larger, and gas piping over 5 psi except plastic underground piping shall be welded. Welding shall be done using either gas or electric welding equipment. No electric welding shall be done when the atmospheric temperature is below 40 degrees F. without first preheating the ends of the pipe. Thoroughly clean all piping surfaces before welding. The width of circumferential welds shall be 2-1/2 times the wall thickness of the pipe. Piping shall be securely aligned and spaced. The deposited metal shall form a gradual increase in thickness from the outside surface to the center of the weld. Make welds in at least two beads. Each shall be cleaned using stiff wire brushes or pointed descaling tools. The final beads shall be similarly cleaned for inspection.
3. Fittings -
 - a. All fittings shall be ASA Standard fittings and shall be of standard pipe thickness.
 - b. All elbows shall be long radius.
 - c. Wherever tee connections are made to piping systems on the main run, welding sockets shall be installed for the branch connections up to one half the size of the main run, welding tees shall be used.
 - d. The use of fittings formed from welded pipe sections and or notching of pipe will not be permitted. Changes in pipe size shall be made with tapered fittings.
 - e. Connection to equipment shall be flanged using std 150 psi weld neck flanges or flanges rated for pressure of system encountered. Gaskets shall be non-asbestos type of material suitable for temperature, pressure and substance in system.
 - f. All welding fittings used in welding system shall be manufactured by Tube Turns Inc., Taylor Forge and Pipe Works, Midwest Piping and Supply Co., or Bonney Forge and Tool Works, for "Weld-O-Lot" or Thread-O-Lot", or approved equal fittings and shall match the pipe in which they are installed.
4. Safety precautions -
 - a. The contractor shall provide a fire proof mat or blanket to protect the structure, and adequate fire protection at all locations where welding is done.
5. Testing and acceptance -
 - a. Engineer and Owners Representative shall inspect welds at their discretion. If welds are found to be suspect, contractor shall provide testing of questionable welds at contractor's expense.
 - b. Testing shall be by radiograph, ultrasonic, sectioning or a combination of these methods at the option of the Owner.
 - c. The contractor shall test a minimum of 6 welds up to a maximum of 1/4 of all welds on project as selected by Engineer.
 - d. Tests shall be performed by a recognized independent testing agency acceptable to all parties. Agency shall submit a test report.
 - e. If defective joints are discovered Owner shall have right to require all welds removed and redone or remaining welds tested and all

defective welds replaced. All work to test, remove and replace welds shall be at contractor's expense.

3.7 PIPE CLEANING AND DISINFECTION:

- A. All piping shall be flushed clean before connection to equipment. Domestic water lines shall be thoroughly flushed out with an alkaline detergent solution to remove pipe dope, oil, loose mill scale, and other extraneous materials.
- B. After the water system has been flushed clean, the shutoff valve to the water main shall be closed. All fixture outlets shall be opened slightly. A solution of sodium hypochlorite and clean water shall be introduced at the new tie-in to the existing water pipes downstream of new valve, until residual chlorine is detected at all water faucets, outlets, etc. The solution shall consist of 1 gallon of 5 percent sodium hypochlorite (Chlorox or Purex) to 200 gallons of water. The solution shall be flushed and all aerators and strainers shall be removed, cleaned and replaced. Care shall be taken to not allow solution to enter existing piping.
- C. Contractor shall furnish to Owner and Architect a written report certifying completion that pipe cleaning and disinfection has been completed and accepted.

3.8 PIPE TESTING:

- A. Test all piping prior to painting, insulating, backfilling or other concealment. Valve off or isolate controls, fittings, equipment or other piping which may be damaged by testing pressures. Provide relief valves set to avoid bursting pressure during test.
- B. Soil, waste, rainwater and vent systems shall be filled to roof level with water and show no leaks over a 24 hour period.
- C. Domestic water, chilled water supply and return, and heating hot water supply and return piping shall be hydrostatically tested at 100 psi with less than a four percent drop in pressure over a six hour period.

END OF SECTION 15101

SECTION 15182 - HYDRONIC PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Furnishing and installing the heating hot water system and specialties.
- B. Related Sections -
 - 1. Sections 15010, 15051, and 15101 apply to this section.
 - 2. Section 15910 Automatic Temperature Controls

PART 2 - PRODUCTS

2.1 PIPE ALL SYSTEMS:

- A. Black steel schedule 40 pipe for supply and return.
 - 1. ASTM-A53
 - 2. ASTM-A106
- B. Fittings
 - 1. Low temperature heating hot water system fittings shall be
 - a. Steel 150 lb rated threaded or welded.
 - b. Flanges standard steel 150 lb.
 - 2. Chilled and cooling water systems fittings shall be:
 - a. Steel 150 lb rated threaded or welded.
 - b. Flanges 150 lb standard steel.
 - 3. Condenser water systems fittings shall be:
 - a. Steel 150 lb threaded or welded
 - b. Flanges 150 lb standard steel.
 - 4. High temperature hot water systems fitting shall be.
 - a. Steel 300 lb welded steel
 - b. Flanges 300 lb steel
 - c. Valves rated for 300 lb

2.4 VALVES

- A. Valves
 - 1. Provide on each valve a name plate showing manufacturer, valve size, grade, and pressure temperature service rating. Valve fluid bore shall match pipe size. All valves shall have renewable seats and discs, large deep stuffing boxes, packing glands and back seat on stem for repacking under pressure. Valves 1-1/2" and smaller shall be screwed or soldered connections. Valves 2" and larger shall be flanged.
- B. Butterfly Valves -
 - 1. Operable in any quadrant, shall operate properly with flow in either direction, and fully suitable for throttling and tight shut-off service.
 - 2. Pressure drops at valve flows shall not exceed that for Centerline valves.
 - 3. 150 psi working pressure and -40 to 275 Deg F.
 - 4. Body - Ductile iron lug-wafer type with lugs tapped on both sides.
 - 5. Seat - EPT Nordel, rubber lined.

6. Stem -
 - a. 304 or 316 stainless steel.
 - b. Diameter not to be reduced at bearings.
 7. Disc - Bronze or NDI (nylon coated ductile iron), bubble tight at 150 psig.
 8. Bushings -
 - a. Reinforced teflon, nylon, or olitie.
 - b. Provide bearings at both ends of stems.
 9. Operating Mechanisms - Infinite throttling handle with provision for locking in any position and with position stop.
 10. Approved Manufacturers -
 - a. Bray - Series 30
 - b. Centerline - Series 200
 - c. Crane - 'Monarch' Series
 - d. Milwaukee - ML233E
 - e. Norris/O'Bannon - R Series
 - f. Pratt - Model 2FII
 - g. Watts BF-03
 - h. Hammond
 - i. Nibco Inc
 - j. Kitz
- C. Check Valves
1. Non-Slam Check Valves -
 - a. Silent, spring loaded.
 - b. 125 psi swp
 - c. Silent, semi-steel body.
 - d. Bronze trim and discs.
 - e. Bronze seats with center guide and renewable with reseating with special tools.
 - f. Guided spring.
 - g. Operable in horizontal, vertical, angular, or upside down position.
 - h. Approved Manufacturers -
 - 1) Bell & Gossett ITT or equal by
 - 2) Milwaukee
 - 3) Mueller
 - 4) Nibco Inc.
 - 5) Kitz
- D. Ball Valves
1. Designed for shut off service.
 2. Type 2, Class A rated at 150 lb steam working pressure and 350 deg F maximum temperature.
 3. Two piece bronze body construction with full port, vented ball, screwed end connections, blow-out proof stem, and teflon seats.
 4. Provide extended stem on insulated line.
 5. Approved Manufacturers -
 - a. ConBraco - Apollo - 70-100 or equal by
 - b. Hammond
 - c. Milwaukee
 - d. Nibco
 - e. Watts
 - f. Kitz
- E. Balancing Valves

1. Combination balancing valve and flow metering device with provision for connecting differential meter. Each meter connection shall have positive shut-off valves.
2. Valve shall be of non-ferrous construction and globe style design or proportional flow ball valve.
3. Valve shall be capable of being installed either direction in the flow and not affect flow measurement.
4. Unit shall -
 - a. provide precise flow measurement.
 - b. have precision flow balancing.
 - c. have positive shut-off with no-drip seat.
5. Approved Manufacturer -
 - a. Bell and Gossett
 - b. Armstrong CBV
 - c. Flow-set
 - d. HCI

2.5 COCKS:

- A. Gauge Cocks -
 1. Brass Tee Handle
 2. Approved Manufacturers -
 - a. Ashcroft - 1092
 - b. Ernst - 123
 - c. Trerace - 865
 - d. Walworth - 557

2.6 MANUAL AIR VENT BALL VALVE:

- A. Designed for use as a high point vent.
- B. Rated for 150 lb working pressure water, oil, gas, and steam.
- C. Bronze body with solder end connections, teflon stem & seats, and bubble tight shut-off. 3/8 inch size with tee handle.
- D. Approved Manufacturers -
 1. ConBraCo Appollo - 70-200.
 2. Hammond - 806
 3. Jenkins - 1100T
 4. Milwaukee - BA150-TH
 5. Nibco S580

2.7 COMBINATION BALL VALVE, HOSE CONNECTION, & CAP:

- A. Approved Manufacturer -
 1. ConBraCo - Apollo 78-100

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Section 15101 for general piping installation procedures.

- B. Install unions or flanges on downstream side of shut-off valves, specialty valves, and inlet and outlet to coils, pumps, and equipment.
- C. Install thermometers on inlet and outlet of coils, pumps, and where shown on the drawings.
- D. Install pressure gauges at pump suction and discharge as close as possible to the connections and where shown on the drawings.
- E. Install balancing valves as shown on the drawings.
- F. TESTING:
 - 1. Conduct tests in presence of Engineer and before piping is covered.
 - 2. Tests shall be as described in Section 15101 of the specifications.

END OF SECTION 15182

SECTION 15812 - ROUND STEEL DUCTWORK

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Ducts -
1. Fabricate of zinc-coated lock forming quality steel sheets meeting requirements of ASTM A 527-80, "Sheet Steel Zinc Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with Type G coating.
 2. Use of aluminum or non-metal ducts is forbidden.
 3. Duct shall be constructed to SMACNA Pressure Class ½" to 2" standards.
- B. Joints
1. Mechanical type joints shall be sealed with:
 - a. Hardcast
 - b. Design Polymetrics 1010
 - c. Mon-Eco Industries 4452
 2. Welded joints are acceptable.
 3. Joints shall be as recommended in SMACNA HVAC Duct Construction Standards for round duct.
- C. Fittings:
1. Ducts shall be provided with 45 and 90 degree elbows of 2-piece die stamped construction.

- 2.2** Ductwork shall be shop fabricated or spiral ductwork manufactured by a manufacturer regularly engaged in the manufacture of this type of ductwork. Ductwork shall meet all requirements of SMACNA and manufacturer shall be prior approved.

- 2.3** Standing seam duct may be used in lieu of spiral duct if properly constructed for velocity and pressures encountered.

- 2.4** Duct take-offs and volume dampers. See Section 15820.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Ducts
1. Straight and smooth on inside with joints neatly finished unless otherwise directed.

END OF SECTION 15812

SECTION 15813 - MEDIUM VELOCITY DUCTWORK (PRESSURE CLASS 2" & 3" SEAL CLASS B)

PART 1 - GENERAL

1.1 RELATED SECTION:

- A. Division 01 General and Section 15010 and 15051 are part of this section.

PART 2 - PRODUCTS

- 2.1** Supply air ductwork shown upstream of VAV boxes shall be spiral acoustical duct consisting of an externally pressure-tight metal sheet, a layer of fire resistant fiber glass insulation, an internal liner next to the air flow and a perforated galvanized steel liner. All fittings shall have solid, perforated steel liners. All other round above grade supply and return air ductwork as described in Section 15812 shall be wrapped with insulation.
- 2.2** Equal to United Sheet Metal Acoustic K-27.
- 2.3** Manufacturers shall be those regularly engaged in the manufacturers of this product. Approved manufacturers: United Sheet Metal, Dee's, Metco, or prior approved equal.
- 2.4** As an alternative standing seam ductwork may be used in lieu of spiral duct as long as it is constructed for velocity and pressures encountered.
- 2.5** Joint Sealer
 - A. Mon-Eco 44-52
 - B. Prior Approved Equal

PART 3 - EXECUTION

- 3.1** Duct installation and sealing shall be in strict accordance with SMACNA HVAC duct construction standards and HVAC air duct leakage test manual.

END OF SECTION 15813

SECTION 15816 - STEEL DUCTWORK

PART 1 - GENERAL

1.1 SCOPE

- A. Includes -
 - 1. Furnish and install the ½" to 2" wg ductwork and related items specified below and shown on the Drawings.
 - 2. Ductwork shall be installed in strict accordance with SMACNA Standards (latest edition) for exterior installation.
- B. Related Work Specified Elsewhere -
 - 1. General Division 01 and Section 15010 and 15051 are a part of this Section.

PART 2 - PRODUCTS

2.1 DUCT MATERIAL

- A. Fabricate of zinc-coated lockforming quality steel sheets meeting requirements of ASTM A 527-80 with Type G coating.
- B. Use of aluminum or non-metal ducts is forbidden.

PART 3 - EXECUTION

3.1 DUCTS

- A. Straight and smooth on inside with joints neatly finished unless otherwise directed.
- B. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
- C. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- D. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on drawings.
- E. Ducts shall be large enough to accommodate inside acoustic duct liner.
- F. Install internal ends of slip joints in direction of flow. Make joints air tight using mastic type duct sealer.
- G. Cover horizontal and longitudinal joints on all ducts with two layers of hardcast tape installed with hardcast HC-20 adhesive according to manufacturer's recommendations, or equivalent by Duro Dyne Corporation or H.B. Fuller Company.
- H. Install flexible inlet and outlet duct connections to terminal units, fan coils, air handlers and exhaust fans.
- I. Provide each duct take-off with an adjustable volume damper to balance that branch -
 - 1. Anchor dampers securely to duct.
 - 2. Install dampers in main ducts within insulation.
 - 3. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.

- J. Install grilles and diffusers.
- K. AIR TURNS -
 - 1. Permanently installed, consisting of curved metal blades or vanes arranged to permit air to make abrupt turn without appreciable turbulence, in elbows of supply and above ground return ductwork.
 - 2. Air turns shall be quiet and free from vibration when system is in operation.

END OF SECTION 15816

SECTION 15818 - FLEXIBLE DUCT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Includes But Not Limited To -
 - 1. Supply air branch duct runouts to diffusers where indicated on Drawings.
- B. Related Work Specified Elsewhere -
 - 1. Volume dampers and sheet metal duct specified in section 15812.

1.2 RELATED SECTIONS

- A. Division 01 General and sections 15010 and 15051 are part of this section.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Ducts -
 - 1. Formable, flexible, circular duct which shall retain its cross-section shape, rigidity, and shall not restrict air flow after bending.
 - 2. Nominal 1-1/2 inches thick, 3/4 lb/cu ft density fiberglass insulation with air-tight, see-through polyester core, sheathed in seamless vapor barrier jacket factory-installed over flexible assembly.
 - 3. Each individual component in assembly, including insulation, ductwork and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
 - 4. Approved Manufacturers -
 - a. Flexmaster
 - b. Thermaflex
 - c. Wiremold

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct in fully extended condition free of sags and kinks, using 6'-0" maximum lengths.

END OF SECTION 15818

SECTION 15819 - DUCTWORK TESTING

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Division 01 General and sections 15010 and 15051 are part of this section.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 PROCEDURE

- A. All ductwork shall be tested prior to concealing or other work which may prevent repair of ductwork. Refer to "Inspection Notice", section 15051.
- B. Duct testing shall consist of pressurizing the duct system either with the main blower or in sections using a portable blower. Each portion of ductwork to be tested shall be sealed at all openings. The ductwork shall be subjected to an internal pressure not less than 2" W.G or 1-1/2 times working pressure whichever is larger. All ductwork shall be surveyed for audible leaks, and structural stability. Leaks shall be sealed, weak joints repaired, vibrations eliminated. A log shall be kept by the contractor indicating date, conditions, repairs made, and name of individual(s) performing the test. A copy of the log shall be retained for possible observation at the request of the Owner or architect. Ductwork shall maintain test pressure with not more than 10% variation over the period of the test.

END OF SECTION 15819

SECTION 15820 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Sections
 - 1. Section 15051- General Mechanical Requirements
 - 2. Section 15910- Automatic Temperature Controls

1.2 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM A 653-96, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'
 - 2. ASTM C 665-96, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing'
 - 3. ASTM C 1071-91, 'Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)'

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Flexible Equipment Connections
 - 1. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
 - 2. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 200 deg F.
 - 3. Approved Manufacturers -
 - a. Cain - N-100
 - b. Duro Dyne - MFN
 - c. Elgen - ZLN
 - d. Ventfabrics - Ventglas
- B. Duct Access Doors
 - 1. Factory built insulated access door with hinges and sash locks. Construction shall be galvanized sheet metal, 24 ga minimum.
 - 2. Fire and smoke damper access doors shall have a minimum clear opening 12 inches square or as shown on Drawings to easily service fire damper.
 - 3. Approved Manufacturers -
 - a. AirBalance - Fire/Seal FSA 100
 - b. Cesco-Advanced Air - HAD-10
 - c. Elgen - Model 85 A
 - d. Flexmaster - Spin Door
 - e. Hercules

- f. Kees Inc - ADH-D
 - g. Pottorff - 60-HAD
 - h. Ruskin - ADH-24
 - i. Safe-Air - SAH
- C. Dampers & Damper Accessories
 - 1. Concealed Ceiling Damper Regulators -
 - a. Approved Manufacturers -
 - 1) Cain
 - 2) Duro Dyne
 - 3) Metco Inc
 - 4) Vent-Lock - 666
 - 5) Young - 301
 - 2. Volume Dampers -
 - a. Factory-manufactured 16 gauge galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch clearance all around.
 - 1) Damper shall operate within acoustical duct liner.
 - 2) Provide channel spacer equal to thickness of duct liner.
 - b. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - c. Approved Manufacturers -
 - 1) American Warming
 - 2) Arrow
 - 3) Cesco
 - 4) Daniel
 - 5) Greenheck
 - 6) Pottorff
 - 7) Ruskin
 - 8) UTEMP
 - 9) Safe-Air
 - 10) Air-Rite
- D. Air Turns
 - 1. Single thickness vanes with one inch trailing edge. Double thickness vanes not acceptable.
 - 2. 4-1/2 inch wide vane rail. Junior vane rail not acceptable.
- E. Branch Tap for Round and Flexible Ductwork (High efficiency type)
 - 1. Factory-manufactured rectangular-to-round or round-to-round 45 degree leading tap fabricated of 24 ga zinc-coated lockforming quality steel sheets meeting requirements of ASTM A 653, with G-90 coating.
 - 2. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - 3. Manual Volume Damper -
 - a. Single blade, 22 ga minimum
 - b. 3/8 inch minimum square rod with brass damper bearings at each end.
 - c. Heavy duty locking quadrant on 1-1/2 inch high stand-off mounting bracket attached to side of round duct.
 - 4. Approved Models & Manufacturers – Approved Products
 - a. HETD-L by Daniel Manufacturing, Ogden, UT (801) 622-5924

- b. STO by Flexmaster USA Inc, Houston, TX (713) 462-7694
- c. HET by Sheet Metal Connectors Inc, Minneapolis, MN (612) 572-1100
- d. Hercules
- e. Air-Rite
- f. Prior approved equal
- F. Duct Sealer for Interior Ducts
 - 1. Approved Manufacturers and products-
 - a. Duct Butter or Butter Tak by Cain Manufacturing Co Inc, Pelham, AL (800) 554-0342 or (205) 663-2200 <http://www.cainmfg.com> or (714) 432-0600
 - c. S2 by Duro Dyne, Farmingdale, NY (800) 899-3876 or (516) 249-9000
 - d. Versa Grip 102 by Hardcast Inc, Wylie, TX (800) 527-7092 or (972) 442-6545
 - e. 15-325 by Kingco, King Adhesive Corp, St Louis, MO (800) 233-8171 or (314) 772-9953
 - f. 44-41 by Mon-Eco Industries Inc, East Brunswick, NJ (800) 899-6326 or (908) 257-7942
 - g. Airseal #11 by Polymer Adhesive Sealant Systems Inc, Irving, TX (888) 721-7325
 - h. Multipurpose Duct Sealant by Trans-Continental Equipment Co,
 - i. Water Base Duct Sealer by United McGill Corp, Columbus, OH (800) 624-5535 or (614) 836-9981

2.2 FABRICATION

- A. Air Turns
 - 1. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - 2. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install flexible inlet and outlet duct connections to each fan powered VAV box.
- B. Access Doors in Ducts
 - 1. Install at each manual outside air damper and at each motorized damper. Locate doors within 6 inches of installed dampers.
- C. Dampers & Damper Accessories
 - 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
 - 2. Provide each take-off with an adjustable volume damper to balance that branch.
 - a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.

- c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
- d. Where concealed ceiling damper regulators are installed, provide cover plate.

END OF SECTION 15820

SECTION 15822 - ACOUSTICAL DUCT LINER

PART 1 - GENERAL

1.1 SCOPE -

- A. Includes -
 - 1. Acoustical lining of all rectangular supply and return air ductwork -
- B. Insulation materials, adhesives, coatings, and other accessories shall have surface burning characteristics as determined by ASTM E 84 not to exceed 25 for flame spread and 50 for smoke developed. Flame proofing treatments subject to deterioration due to the effect of moisture or high humidity are not acceptable.
- C. Duct dimensions shown on drawings are for inside of duct liner and do not include liner insulation.

1.2 RELATED SECTIONS -

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

PART 2 - PRODUCTS

2.1 DUCT LINER -

- A. One inch thick, 1-1/2 lb density fiberglass.
- B. Approved Manufacturers -
 - 1. CSG Ultralite OR Tough guard
 - 2. Johns-Manville Lina-Coustic
 - 3. OCF Aeroflex
 - 4. Knauf Type M

2.2 ADHESIVE -

- A. Approved water base products-
 - 1. Cain - Hydrotak
 - 2. Design Polymerics - DP2501 or DP2502 (CMCL-2501)
 - 3. Duro Dyne - WSA
 - 4. Hardcast - IA-901
 - 5. Kingco - 10-568
 - 6. Miracle - PF-101
 - 7. Mon-Eco - 22-67
 - 8. Polymer Adhesive - Glasstack #35
 - 9. Techno Adhesive - 133
 - 10. United McGill - Uni-tack

2.3 MECHANICAL FASTENERS -

- A. Conform to Mechanical Fastener Standard MF-19/1.
- B. Pins that attach to ductwork with adhesives are not allowed.
- C. Approved Manufacturers -

1. Duro Dyne
2. Omark dished head "Insul-Pins"
3. Grip nails may be used if each nail is installed by "Grip Nail Air Hammer" or by "Automatic Fastener Equipment" in accordance with Manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with a continuous 100% coat of adhesive and with mechanical fasteners spaced as shown on drawings. Pin all duct liner.
- B. Accurately cut liner and thoroughly coat exposed edges of duct liner, including diffuser drop cut-outs with adhesive to seal fibers. Butt joints tightly. Top and bottom sections of insulation shall overlap sides.
- C. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty.
- D. If insulation is installed without horizontal, longitudinal, and end joints butted together and properly treated, installation will be rejected and work removed and replaced with work that conforms to this specification. See drawings for detail of joint treatment.

END OF SECTION 15822

SECTION 15842 - FAN POWERED VAV BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fan powered variable volume terminal units.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Box linkage, actuators, controllers etc that interface with the DDC system shall be coordinated with the ATC contractor specified under section 15910 and factory installed under this Section.

1.3 RELATED SECTIONS

- A. Section 15910 Automatic Temperature Controls
- B. Division 16 - Equipment Wiring Systems: Electrical supply to units.

1.4 REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. UL 181 - Factory-Made Air Ducts and Connectors.
- C. ARI 880 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals
- D. ASTM A 527 (Steel Sheet, Zinc Coated Galvanized)
- E. NFPA 90A, Lining

1.5 SUBMITTALS

- A. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication.
- B. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and radiated sound power levels (2nd through 7th octave bands) at design maximum operating conditions. Also submit Radiated Sound NC values ARI 885-90.
- C. Submit manufacturer's installation instructions.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data provide to mechanical contractor for inclusion in O & M Manual see Section 15010.
- B. Include manufacturer's descriptive literature, operating instructions, maintenance, and repair data.
- C. Include directions for resetting all pneumatic and electronic controls.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum ten years experience.

1.8 WARRANTY

- A. Provide one year manufacturer's parts warranty from date of acceptance of system.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Fan Powered Boxes – Constant Volume Series Units
 - 1. General
 - a. Furnish and install fan powered units with capacities and sizes as listed on the schedule of drawings.
 - b. Unit casings shall be a minimum of 22 gauge galvanized steel fully lined with 1" 1-1/2 lb density fiberglass insulation. Insulation shall comply with U.L. standard 181 and NFPA 90-A.
 - c. All unit casings shall have access door(s) for easy access to motor and blower assembly for maintenance and replacement of parts. Bottom or top access to blower and motor assemblies are not acceptable.
 - d. Blower casings shall be constructed of heavy gauge steel and baked enamel finish. Fan wheel shall be forward curved centrifugal type, dynamically balanced and be driven by direct drive, single speed split capacitor motors. An electronic motor speed control shall be provided to allow continuously adjustable fan speed from minimum voltage stop to insure motor cannot operate in a stall mode. Fan assembly shall be mounted on a 16 gauge steel subbase, but shall be internally isolated with rubber-in-shear isolators to prevent vibration to the sub-base. Motors shall also be isolated with rubber-in-shear isolators between the motor mounting legs and the blower casing.
 - e. VAV terminal units shall be pressure independent with electric/electronic controls.
 - f. The primary air damper assembly shall be constructed of heavy gauge galvanized steel with solid shaft rotating in self lubricating bearings. Damper shaft shall be marked on the end to indicate damper position. Damper blade shall incorporate a flexible gasket for tight airflow shutoff and operate over a full 90 degree rotation.
 - g. Entire terminal unit shall be factory assembled with electric/electronic controls. Metal assembly shall be mechanically sealed and fastened and shall be free of welds.
 - h. Unit shall be equipped with a factory installed airflow sensing device. Provide a linear, multi-point, velocity averaging sensor with an amplified signal. All controls shall be easily accessible for field adjustments without having to remove any of the terminal casing or any access panels.
 - i. Sound Data shall be compiled from testing in an ADC independent, certified laboratory and in accordance with ADC standard 1062-R4 and ISO standard 3741.
 - 2. Controls

- a. Controls shall be electric/electronic and shall be coordinated with and compatible with building controls package as supplied under Section 15910 of this specification.
- 3. Coils
 - a. A hot water coil shall be part of the total listed package and shall be labeled and approved as a component part of the total fan powered package. All wiring for the motor shall terminate in a NEM 1 enclosure and have a single point connection for the electrician to hook-up to in the field. Heater casing and panel shall be a minimum of 20 gauge galvanized steel. Hot water coils shall be factory mounted as an integral unit of the fan package and shall be approved as a total package of the fan powered unit, and shall be mounted on the discharge side of the fan assembly to prevent overheating of the motor bearings. Provide with flanged discharge for attachment to downstream ductwork.
 - b. Coils shall be factory installed on the terminal unit. Fins shall be rippled and corrugated heavy gage aluminum, mechanically bonded to tubes. Tubes shall be copper with minimum wall thickness of 0.016" and with male solder header connections. Coils shall be leak tested to 400 psi. Number of coil rows and circuits shall be selected to provide performance as required by the plans. Coil performance data shall be based on tests run in accordance with ARI Standard 410. See schedule sheet for BTU and performance required.
- 4. Back Draft Dampers
 - a. A backdraft damper shall be installed in the discharge of the blower assembly to prevent reverse air flow when the fan is not operating. Damper shall be aluminum and shall be gasketed.
- 5. Regulatory Agency Approval
 - a. The entire fan powered package with hot water coils must be labeled and listed by a nationally recognized and locally accepted testing laboratory, such as ETL Testing Laboratory, Inc., and shall be approved and tested for safety in accordance with the latest N.E.C.
- 6. Accessories
 - a. Each fan powered package shall have a disconnect switch toggle mounted and prewired so as to disconnect all electric components of the fan package and wired so as to have a single source field connection at the disconnect switch, return air filters sound inlet boot, discharge sound boot, and totally enclosed motors.
 - b. Approved Manufacturers -
 - 1) Price FDCG
 - 2) Krueger QFC or equal by
 - 3) Titus
 - 4) Prior approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design primary air flow to 30 percent nominal primary air flow.

END OF SECTION 15842

SECTION 15851 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents
 - 2. Quality of grilles installed in metal doors
- B. Related Sections
 - 1. Section 15051 - General Mechanical Requirements

1.2 MAINTENANCE

- A. Extra Materials - Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Ceiling Return, Exhaust, and Transfer Grilles
 - 1. Finish - Off-white baked enamel
 - 2. 1/2 inch spacing.
 - 3. Approved Manufacturers And Models -
 - a. Carnes - RSLA
 - b. J & J - S90H
 - c. Krueger - S85H
 - d. Metalaire - SRH
 - e. Price - 535
 - f. Titus - 355RL or 355 SL
 - g. Tuttle & Bailey - T70D or equal by
 - h. Agitair
 - i. Anemostat
 - j. Barber Colman
 - k. Environmental Air Products
 - l. Air Control Products
 - m. Nailor
- B. High Side Wall Return Grilles
 - 1. Finish - Off-white baked enamel
 - 2. Approved Manufacturers And Models -
 - a. Carnes - RHEA
 - b. J & J - 2810
 - c. Metalaire - 41C
 - d. Krueger - 5810
 - e. Price - LBMR
 - f. Titus - 1700
 - g. Tuttle & Bailey - VF

- or equal by
 - h. Agitair
 - i. Anemostat
 - j. Barber Colman
 - k. Environmental Air Products
 - l. Air Control Products
 - m. Nailor
- C. Ceiling Diffusers
 - 1. Finish - Off-white baked enamel
 - 2. Approved Manufacturers And Models -
 - a. Carnes - SKSA
 - b. J & J - R-1400
 - c. Krueger - SH
 - d. Metalaire - 5500S
 - e. Price - SMD-6
 - f. Titus - TDC-6
 - g. Tuttle & Bailey - MS
 - Or equal by:
 - h. Agitair
 - i. Anemostat
 - j. Barber Colman
 - k. Environmental Air Products
 - l. Air Control Products
 - m. Nailor

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side. Level floor registers and anchor securely into floor.

END OF SECTION 15851

SECTION 15910 - AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL CONDITIONS

1.1 GENERAL CONDITIONS

- A. All pertinent sections of Section 15100, Division 15, are a part of the work described in this section. Division 1 is a part of this and all other sections of these specifications.

1.2 SCOPE OF WORK

- A. The scope of work shall include all labor, material, and equipment necessary to complete the temperature control work for the entire project.
- B. The Building Automation System (BAS) in the College Center shall be an extension of the existing Johnson Controls Metasys campus BAS. Integrate the new local controllers with the existing system for remote monitoring and control. The BAS shall incorporate Direct Digital Control (DDC) for equipment and direct communication to the Central Operator Workstations for remote monitoring and control.
- C. All line and low voltage control wiring for the temperature control system shall be installed **in conduit** in accordance with the National Electric Code, Local Codes, and DFCM and SLCC Standards.
- D. This contractor shall carefully review all notes, coordination schedules, and drawings for work required under this section of the specification.
- E. Adjustment and validation of control system. Instruction of Owner's representative on maintenance and operation of control equipment.
- F. Composite diagrams showing interlocks between equipment furnished under this and other sections.
- G. This system shall include but not be limited to controls and equipment for the Facilities Shop Building as hereinafter specified:
 - 1. VAV Fan Powered Boxes

1.3 EXECUTION

- A. Related Work in Other Sections:
 - 1. Examine all sections for work related to work of this section, principal items of which are:
 - a) Finished Division 9
 - b) Mechanical Division 15
 - c) Electrical Division 16
 - 2. The following incidental work shall be furnished by the designated contractor under the supervision of the Temperature Control Contractor:
 - a) The Mechanical Contractor shall:
 - 1) Install automatic valves, and separable wells that are specified to be supplied by the temperature control contractor.
 - 2) Furnish and install all necessary piping connections required for flow devices.

- b) The Sheet Metal Contractor shall:
 - 1) Install all automatic dampers and provide necessary blank-off plates or transitions required to install dampers that are smaller than duct size.
 - 2) Assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.
 - 3) Provide necessary sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation and fix and seal permanently in place only after stratification problems have been eliminated.
 - 4) Provide access doors or other approved means of access through ducts for service to control equipment.
 - 5) Furnish and install all smoke/fire dampers with electric actuators to meet UL listing.
- c) The Electrical Contractor shall:
 - 1) Furnish and install line voltage power where shown on the Electrical drawings is furnished and wired by Division 16.
 - 2) Furnish and install 120 volt, 20 amp breaker for all ATC Panels. Refer to electrical power plan and mechanical drawings for location of ATC Panels.
 - 3) Air Handling Unit duct smoke detectors shall be furnished, installed and wired by Division 16000, Electrical Contractor. Fan shutdown from the building Fire Alarm Panel by Division 16.
 - 4) Provide the interlock control and wiring for the smoke/fire dampers furnished by the sheet metal contractor.
- B. Performance:
 - 1. Control system shall be an extension of the existing electronic direct digital control system with remote monitoring and control at the campus Operator Workstations.
 - 2. Qualified Contractors: Johnson Controls Inc., Branch Office
- C. Submittals:
 - 1. The following shall be submitted for approval:
 - a) Data sheets for all control systems and components.
 - b) Valve, damper, showing sizes, configuration capacity and location of all equipment.
 - c) Control system drawings containing pertinent data to provide a functional operating system, including a sequence of operation. Detailed shop drawings may be submitted in as-built form upon project completion.
 - d) Submit six (6) complete sets of documentation.
- D. Wiring:
 - 1. Electric wiring and wiring connections required for the installation of the temperature control system as herein specified, shall be provided by the Temperature Control Contractor unless specifically shown on the drawings or called for in the specifications to be by the Electrical Contractor. Install wiring in accordance with the local and national electrical codes.

2. Wiring from the building fire alarm panel to smoke detectors shall be furnished and installed by Electrical Contractor.
 3. Fan shutdown wiring from the Fire Panel shall be furnished and installed by the Electrical Contractor.
 4. All cable shall be minimum 18 awg twisted shielded.
 5. All cabling including communication cabling, binary inputs, binary outputs, analog inputs and analog outputs shall be wired using the same color cable for each type of I/O and/or communication type. (Example analog in = Yellow, analog output = tan, binary in = orange, binary out = purple, communication = blue.)
 6. All cabling including communication cabling, binary inputs, binary outputs, analog inputs and analog outputs shall be labeled at least every 2 feet with the communication and/or I/O designation type.
- E. Instruction and Adjustment:
1. Upon completion of the project, the Temperature Control Contractor shall adjust and validate all thermostats, controllers, valves, damper operators, relays, etc. provided under this section.
 2. Instruction manuals shall be furnished covering the function and operation of the control system on the project for use by the owner's operating personnel. An instruction period last not less than **two (2) hours** shall be provided to completely familiarize operating personnel with the temperature control system and direct digital controllers on the project.
- F. Warranty:
1. Upon completion of the project as defined either by acceptance of the building by the Owner or by beneficial use of the equipment by the Owner, a warranty period of one year shall commence. The warranty shall consist of a commitment by the Automatic Temperature Control Contractor to provide at no cost to the Owner, parts and labor as required to repair or replace such parts of the temperature control system that prove inoperative due to defective materials or installation practices. This warranty expressly excludes routine service such as filter cartridge replacement, compressor lubrication or instrument calibration.
- G. Project Completion Documentation:
1. Submit three (3) copies of operation and maintenance manuals including:
 - a) Manufacturer's catalog data and specification of sensors, controllers, valves, actuators and other components.
 - b) An operator's manual which will include detailed instruction for all operation of systems.
 - c) A copy of the warranty letter.
 - d) Control drawings with sequence of operation and bill of materials.
 - e) A list of operating and maintenance procedures.
 2. Submit three (3) copies of Instrument Check-Off sheets including:
 - a) Installation verification of all I/O points signed and dated by the installer that performed the work.
 - b) Software verification check off sheets verifying functional operation in accordance with the sequence of operation signed and dated by the technician that performed the work.

PART 2 - EQUIPMENT

2.1 OVERVIEW

- A. The Automatic Temperature Control of the mechanical equipment shall be through a local standalone DDC controller with electric damper and valve actuators where required. Individual room control functions shall be electronic networked to the Network Control Unit.

2.2 APPLICATION SPECIFIC CONTROLLERS (GENERAL)

- A. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
- B. Each ASC shall have sufficient memory to support its own operating system and data bases including:
 - 1. Generic Input/Output Monitor and Control
 - 2. Control Processes
 - 3. Energy Management Applications
 - 4. Operator I/O (Portable Service Terminal)
- C. Application Specific Controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include but not be limited to the following:
 - 1. Display temperatures
 - 2. Display status
 - 3. Display setpoints
 - 4. Display control parameters
 - 5. Override binary output control
 - 6. Override analog setpoints
 - 7. Modification of gain and offset constants
 - 8. Modified selected HVAC configuration programs and down load modifications.
- D. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

2.3 CENTRAL OPERATOR WORKSTATIONS

- A. This contractor shall modify the existing operating software to monitor and control the mechanical hardware points for the College Center Cashiers Office. The software programming point descriptors shall match the existing campus hardware descriptors. Prior to software programming, submit a point list of system operation to the maintenance staff for review and comments.
- B. Upon substantial completion, this contractor shall perform a software back-up/save of the operating software. One back-up copy shall remain at the central operator workstation location, the other copy will be given to the Maintenance Director.

2.4 TEMPERATURE SENSORS

- A. Space sensors shall have warmer/cooler setpoint adjustments and local override switch. Space sensors shall have a portable service tool jack, fully wired and functional.
- B. Duct mounted averaging sensors shall use a sensing element incorporated in a copper capillary with a minimum length of 20'. The sensor shall be installed according to manufacturers recommendation and looped and fastened at a minimum of every 36".
- C. Thermowells for all immersion sensors shall be stainless steel or brass as required for each application.

2.5 CONTROL VALVES

- A. All automatic control valves shall be fully proportioning with modulating plugs for equal percentage of linear flow characteristics. The valves shall be sized by the control manufacturer and by provided with actuators of sufficient power for the duty intended. Valve body and actuator selection shall be sufficient to handle system pressure and shall close against the differential pressure liable to be encountered on the project.
- B. General: Control Valves up to 4 inch shall be sized for a 3 to 5 psi drop valves shall be pack-less, modulating, pneumatically actuated. These valves shall have a true linear flow characteristic in relationship to valve opening.
- C. Unit Ventilator Valves, ½ Inch to 1 Inch: Valves shall be sized for a 3 to 5 psi drop. Valve body shall be nickel plated brass. Two position valves shall not be allowed.

PART 3 - SEQUENCE OF OPERATION

3.1 FAN POWERED VAV BOXES W/ REHEAT COILS

- A. A space temperature sensor shall, through the Application Specific Controller (ASC), stage the fan, modulate the VAV damper and reheat coil valve in sequence to maintain space temperature set point. The VAV Box minimum and maximum heating and cooling CFM shall be controlled by the ASC. When the heating system is not operating the VAV Box minimum CFM shall be reduced. If any space temperature cannot be maintained at the reduced minimum CFM, the fan system discharge air temperature set point shall be increased until all areas are at or above the heating set point. Application Specific Controller (ASC) shall have an LED indicator to show fan motor status (on/off).

END OF SECTION 15971

SECTION 15960 - AIR SYSTEM TEST AND BALANCE

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Testing, balancing and adjusting of the following systems:
 - a. Supply and Return Air
 - 2. Test Report bound in Operating and Maintenance Manuals.
 - 3. Contractor shall make changes in pulleys, belts, motors and dampers or add dampers as required for correct balance as recommended by Air Balance & Testing Agency at no additional cost to Owner.

1.2 RELATED SECTIONS:

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

1.3 AGENCY:

- A. Contractor shall procure services of an independent Air Balance & Testing Agency which specializes in balancing and testing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
- B. Agency shall provide proof of having successfully completed at least five projects of similar size and scope and be a **certified AABC or NEBB agency**. Work by this Agency shall be done under direct supervision of a qualified registered professional heating and ventilating engineer employed by Agency. Agency shall maintain an office within 75 miles of project.
- C. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
- D. If requested, conduct tests in presence of Engineer.
- E. Agency shall be approved in writing by the Engineer. Neither Engineer nor anyone performing other work on this Project under Division 15 shall be permitted to do this work.
- F. Contractor shall award test and balance contract to the approved agency upon receipt of his contract to proceed to allow Agency to schedule this work in cooperation with other Sections involved and comply with completion date.
- G. Balancing agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of the Air Balancing Test Report.
- H. Engineer will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire project.
- I. Rebalancing shall be done in presence of Engineer and subject to his approval.
- J. Spot balance and rebalance shall be performed at no additional cost to Owner.
- K. Approved Balancing Agencies
 - 1. Bonneville Test and Balance
 - 2. BTC Services
 - 3. Certified Test and Balance
 - 4. Danis Test and Balance

5. Intermountain Test and Balance
6. RS Analysis
7. Technical Specialties
8. Testing and Balancing Inc.
9. Prior approved equal

PART 3 - EXECUTION

3.1 PREPARATION

- A. Begin air balance and testing upon completion of the mechanical installation of air conditioning, ventilation, heating, exhaust systems, and controls including installation of all specialties and devices.

3.2 PROCEDURES:

- A. Before any adjustments are made, the system is to be checked for items such as dirty filters, filter leakage, major duct sections, zones, etc.
- B. Contractor shall place exhaust and ventilating systems and equipment into full operation and continue their operation during each working day of testing and balancing.
- C. Air Balance & Testing Agency shall perform tests specified, compile test data, and submit four copies of complete test data to Contractor for forwarding to Engineer for evaluation and approval.
 1. Approved copies of report shall be bound in Operations & Maintenance Manuals. See Division 15010 General.
- D. Systems shall be completely balanced and all reports submitted to Engineer prior to test run and final inspection.
- E. System performance shall be checked when outside weather is at or near design conditions, if practicable. Heating and/or cooling thermometers or sensors shall be placed in the areas served by each fan system. Temperature readings shall be taken at half hour intervals, and further adjustments or corrections made as required to obtain uniform temperatures. All occupied spaces shall be checked for drafts and noises caused by the make-up and exhaust systems, and any unsatisfactory conditions corrected.
- F. Balancing shall be performed during normal project working hours when project construction foreman is present on the job site to provide access and see his mechanical sub contractor is available to operate system and make necessary corrections.

3.3 STANDARDS:

- A. Balance shall be performed in complete accordance with the following standards as applicable to the agency certification:
 1. HVAC Systems Testing, Adjusting, and Balancing, SMACNA 1983.
 2. Testing, Balancing, and Adjusting of Environmental Systems, SMACNA 1974.
 3. Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems, NEBB 1983.
 4. AABC National Standards, Fourth Edition 1982.
 5. Procedural Standard for Measuring Sound and Vibration, NEBB 1977.

- B. Balancing Agency's National Certification shall warrant the system balance and performance. A copy of guarantee certificate shall be included in each test and balance report.

3.4 TESTING PROCEDURE:

- A. Air Balance & Testing Agency shall perform following tests and balance system in accordance with following requirements:
- B. Test and adjust blower rpm to design requirements.
- C. Test and record motor full load amperes.
- D. Make Pitot tube transverse of main supply and obtain design cfm.
- E. Test and record system static pressures, suction, and discharge.
- F. Test and adjust system for design cfm air.
- G. Test and adjust system for design cfm outside air.
- H. Test and record entering air temperatures (db heating and cooling).
- I. Test and record entering air temperatures (wb cooling).
- J. Test and record leaving air temperatures (db heating and cooling).
- K. Test and record leaving air temperatures (wb cooling).
- L. Adjust main supply and return air ducts to proper design cfm, + or - 5%.
- M. Adjust zones to proper design cfm, supply and return, + or - 5%.
- N. Test and adjust each diffuser and grille to design requirements. Individual air outlets, when one of three or more are serving one space, may have a tolerance of 10% from the average.
- O. Identify each diffuser and grille as to location and area served.
- P. Identify and list size, type, and Manufacturer of diffusers, grilles and testing equipment. Use Manufacturer's rating on equipment to make required calculations.
- Q. In readings and tests of diffusers and grilles include required cfm and fpm velocity & test cfm and fpm after adjustments.
- R. In cooperation with Section 15 900, set adjustments of automatically operated dampers to operate as specified, indicated, or noted.
- S. Adjust diffusers and grilles to minimize drafts.

3.5 EXHAUST AIR SYSTEMS:

- A. Systems are to be adjusted to same tolerance as supply systems. Each space is to be checked to see that it is positive, neutral or negative as indicated by quantities of supply and exhaust air shown on contract documents. Any discrepancies shall be investigated and corrected, and the proper pressure relationship established.
- B. Building pressure shall be checked at outside doors, relief air damper adjusted as required to leave building neutral or under slight positive pressure.

3.6 REPORT

- A. Report shall include:
 - 1. Record test data on AABC standard forms or facsimile thereof.
 - 2. A set of black and white or blue line prints with all air openings marked to correspond with data sheets and with temperature clearly marked.
 - 3. Show on final report the percent of design CFM to the actual CFM of each diffuser represents.

4. The certified report shall include for each air handling system the data listed below:
 - a. Equipment
 - 1) Installation data
 - a) Manufacturer and model
 - b) Size
 - c) Arrangement, discharge, and class
 - d) Motor hp, voltage, phase, cycles, and full load amps
 - e) Location and local identification data
 - 2) Design data
 - a) Data listed in schedules on drawings and specifications.
 - 3) Fan recorded (test) data
 - a) cfm
 - b) Static Pressure
 - c) rpm
 - d) Motor operating amps
 - e) Motor operating bhp
 - b. Duct systems
 - 1) Duct air quantities (maximum and minimum) - main, sub-mains, branches, outdoor (outside) air, total air, and exhaust.
 - a) Duct size(s)
 - b) Number of Pitot tube (pressure) measurements.
 - c) Sum of velocity measurements (Note: Do not add pressure measurements)
 - d) Average velocity
 - e) Recorded (test) cfm
 - f) Design cfm
 - 2) Individual air terminals
 - a) VAV box number and maximum and minimum settings.
 - b) Terminal identification (supply or exhaust, location and number designation)
 - c) Type size, manufacturer and catalog identification
 - d) Applicable factor for application, velocity, area, etc., and designated area
 - e) Design and recorded velocities - fpm
 - f) Design and recorded quantities - cfm
 - g) % of design recorded quantity- cfm represents

END OF SECTION 15960

SECTION 15970- WATER SYSTEM TEST AND BALANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide hot water, chilled water and condenser water system testing & balancing.

1.2 SUBMITTALS

- A. Quality Assurance- Agency will submit four copies of complete test data to Architect for evaluation and approval including neatly typed listing of items required by Contract Documents.
- B. Closeout Submittals- Agency will submit approved copies of water test and balance report for inclusion in Operations & Maintenance Manual.

1.3 QUALITY ASSURANCE

- A. Qualification - Work by Agency will be performed under direct supervision of qualified Heating and Ventilating Engineer employed by Agency.
- B. Approved Balancing Agencies
 - 1. Water test and balance shall be performed by the same agency as the air test and balance.

1.4 SEQUENCING

- A. Test and balance subcontract will be awarded to Agency upon contractors receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with work of other Sections involved and to comply with completion date.
- B. Schedule testing & balancing to begin upon completion of cooling and heating systems including installation of all specialties and devices. Begin work of this Section after heating, ventilating, and cooling systems and equipment are in full operation and continue their operation during each working day of testing and balancing.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Site Tests
 - 1. Instruments used by Agency will be accurately calibrated and maintained in good working order.
 - 2. Balance & Testing Agency will provide technicians with following instruments for field use
 - a. One set of pressure gauges and fittings
 - b. Dry bulb thermometer
 - c. Wet bulb thermometer

- d. Thermocouple unit and thermocouples
- e. Set of balancing cock adjustment wrenches
- f. Portable field flowmeter
- 3. If requested, conduct tests in presence of Architect.
- 4. Preparation of System - Phase I
 - a. Open valves to full position including coil stop valves, close bypass valves, and return line balancing cocks.
 - b. Remove and clean strainers.
 - c. Examine water in system to determine if it has been treated and is clean.
 - d. Check pump rotation.
 - e. Check expansion tanks to make sure they are not air bound and system is full of water.
 - f. Check air vents at high points of water systems to make sure they are installed properly and are operating freely. Make certain air is removed from circulating system.
 - g. Set temperature controls so coils are calling for full heating or cooling.
 - h. Check operation of automatic valves.
 - i. Check and set operating temperature of boilers and chiller to design requirements.
 - j. Perform air balance before beginning water balance.
- 5. Performance of Testing & Balancing - Phase II
 - a. Set pumps to proper gpm delivery.
 - b. Adjust flow of hot water through boilers, chilled water through chiller and condensing water thru chiller and cooling tower.
 - c. Check leaving water temperatures, return water temperatures, and pressure drop through boilers and chiller. Reset to correct design temperatures.
 - d. Check water temperature at inlet side of coils. Note rise or drop of temperatures from source.
 - e. Balance each water coil.
 - f. Upon completion of flow readings and coil adjustments, mark settings and record data.
- 6. Performance of Testing & Balancing - Phase III
 - a. After making adjustments to coils, recheck settings at pumps, chiller, cooling tower and boilers. Readjust if required.
 - b. Install pressure gauges on each coil, then read pressure drop through coil at set flow rate on call for full heating and cooling.
 - c. Check and record the following items at each heating element -
 - 1) Inlet water and air temperatures
 - 2) Leaving water and air temperatures
 - 3) Pressure drop of each coil
 - 4) Pressure drop across bypass valve
 - 5) Pump operating suction and discharge pressures and final TDH
 - 6) Mechanical specifications of pumps
 - 7) Rated and actual running amperage of pump motor

END OF SECTION 15970

SECTION 16001 - ELECTRICAL GENERAL PROVISIONS**PART 1 – GENERAL****1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full.

1.2 DESCRIPTION OF WORK:

- A. The extent of electrical work is indicated on drawings and/or specified in Division 16 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items.

	<u>ITEM</u>	<u>SECTION</u>
1.	Electrical General Provisions	16001
2.	Electrical Connections for Equipment	16070
3.	Demolition	16080
4.	Conduit Raceways	16110
5.	Conductors and Cables	16120
6.	Electrical Boxes and Fittings	16135
7.	Supporting Devices	16136
8.	Wiring Devices	16140
9.	Motor and Circuit Disconnects	16170
10.	Overcurrent Protective Devices	16180
11.	Grounding	16452
12.	Interior and Exterior Building Lighting	16510
13.	Occupancy Lighting Control and Equipment	16561
14.	Fire Alarm and Detection Systems	16721
15.	Telephone System	16740

- B. Use of standard industry symbols together with the special symbols, notes, and instructions indicated on the drawings describe the work, materials, apparatus and systems required as a portion of this work.
- C. Visit the site during the bidding period to determine existing conditions affecting electrical and other work. All costs arising from site conditions and/or preparation shall be included in the base bid. No additional charges will be allowed due to inadequate site inspection.

1.3 DEFINITION OF TERMS

- A. The following terms used in Division 16 documents are defined as follows:

1. "Provide": Means furnish, install and connect, unless otherwise indicated.
2. "Furnish": Means purchase and deliver to project site.
3. "Install": Means to physically install the items in-place.
4. "Connect": Means make final electrical connections for a complete operating piece of equipment.

1.4 RELATED SECTIONS:

- A. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
- B. General and Supplementary Conditions: Drawings and general provisions of contract and Division 1 of the Specifications, apply to all Division 16 sections.
- C. Miscellaneous Metal Work:
 1. Provide fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor controls centers, etc. See Division 5, Metals for material and installation requirements.
- D. Miscellaneous Lumber and Framing Work:
 1. Provide wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment. See Division 6, Rough Carpentry for material and installation requirements.
- E. Moisture Protection:
 1. Provide membrane clamps, sheet metal flashing, counter flashing, caulking and sealants as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors and ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vaportight. See Division 7, Thermal and Moisture Protection for material and installation requirements.
- F. Access panels and doors:
 1. Provide in walls, ceiling, and floors for access to electrical devices and equipment. See Division 8, Doors and Windows for material and installation requirements.
- G. Painting:
 1. Provide surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, poles, surface metal raceways, etc. See Division 9, Finishes for material and installation requirements.

1.5 WORK FURNISHED AND INSTALLED UNDER ANOTHER SECTION REQUIRING CONNECTIONS UNDER THIS SECTION:

- A. Provide electrical service, make requisite connections and perform operational test. Items furnished and installed under other sections and connected under this section, include but are not limited to the following:
1. Electric motors.
 2. Fire and smoke dampers

1.6 WORK NOT INCLUDED IN THIS DIVISION:

- A. Items of work provided under another contract include, but are not necessarily limited to, the following:
1. Telephone cables and electronic equipment.
 2. Data system cables, fittings, coverplates and electronic equipment.
 3. Control wires for irrigation control valves.
 4. Energy management/temperature control system; both line and low voltage including conductors and conduit.
 5. Television monitors and projection equipment.
 6. Security system equipment, cables, fittings, and coverplates.
 7. CCTV and MATV cabling and electronic equipment.

1.7 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:

- A. Before bidding, Contractor shall familiarize himself with the drawings, specifications and project site. Submit requests for clarification to Architect/Engineer in writing prior to issuance of final addendum. After signing the contract, the Contractor shall meet the intent, purpose, and function of the Contract Documents. Any costs of materials, labor and equipment arising therefrom, to make each system complete and operable, is the responsibility of the Contractor.

1.8 QUALITY ASSURANCE:

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies refers to the latest edition of such publications adopted and published prior to submittal of the bid proposed, unless noted otherwise herein. Such codes or standards are considered a part of this specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the Drawings and Specifications. Perform work in accordance with applicable requirements of all governing codes, rules and regulations including the following minimum standards, whether statutory or not:
1. National Electric Code (NEC).
 2. International Building Code (IBC).
 3. International Fire Code (IFC).

4. International Mechanical Code (IMC).

C. Standards: Comply with the following standards where applicable for equipment and materials specified under this Division.

- | | | |
|----|-------|--|
| 1. | UL | Underwriters' Laboratories |
| 2. | ASTM | American Society for Testing Materials |
| 3. | CBN | Certified Ballast Manufacturers |
| 4. | IPCEA | Insulated Power Cable Engineers Association |
| 5. | NEMA | National Electrical Manufacturer's Association |
| 6. | ANSI | American National Standards Institute |
| 7. | ETL | Electrical Testing Laboratories |

D. All electrical apparatus furnished under this Section shall conform to (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.

E. Comply with requirements of State and Local Ordinances. If a conflict occurs between these requirements and the Contract Documents, the most stringent requirements shall govern. The Contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the Contract Documents which may be in excess of the aforementioned requirements, and not contrary to same.

F. Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.

G. Employ only qualified craftsmen with at least three years of experience. Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices. Provide a competent superintendent to direct the work at all times. Any person found incompetent shall be discharged from the project and replaced by satisfactory personnel.

H. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.

1.9 SUBMITTALS:

A. SHOP DRAWINGS AND PRODUCT DATA:

1. After the Contract is awarded but prior to manufacture or installation of any equipment, prepare complete Shop Drawings and Brochures for materials and equipment as required by each section of the specification. Submit 8 complete sets for review. All sets of shop drawing material shall be bound. Prior to submission of the Shop Drawings and Project Data, review and certify that they are in compliance with the Contract Documents. Verify all dimensional information to insure proper clearance for installation of equipment. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents. A minimum period of two weeks, exclusive of transmittal time, will be required each time Shop Drawing and/or Brochure is submitted or resubmitted for review. This time period shall be considered by the Contractor when

scheduling submittal data. If the shop drawings are rejected twice, the contractor shall reimburse the engineer the sum of \$200.00 for the third review and any additional reviews required.

2. Review of Shop Drawings and Brochures shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from the Contract Document's requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Document's shall govern and are not waived, or superseded in any way by the review of the Shop Drawings and Brochures.
3. Certifications shall be written or in the form of rubber stamp impressions as follows:
4. I hereby certify that this Shop Drawing and/or Brochure has been checked prior to submittal and that it complies in all respects with the requirements of the Contract Drawings and Specifications for this Project.

(Name of Electrical Subcontractor)

Signed_____.

Position_____ Date

5. Observe the following rules when submitting the Shop Drawings and Brochures.
 - a. Each Shop Drawing shall indicate in the lower right hand corner, and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Architect and Electrical Engineer, Contractor, Subcontractors, Manufacturer, Supplier/Vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included the submittal will be returned for resubmittal.
 - b. Shop Drawings shall be done in an easily legible scale and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Draftsmen skilled in this type of work. Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.
 - c. Brochures to be submitted shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs which describe several different items in addition to those items to be used, unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

1.10 OPERATION AND MAINTENANCE MANUALS:

- A. Provide operating instruction and maintenance data books for all equipment and materials furnished under this Division.
- B. Submit four copies of operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item. The binder (sized to the material) shall be a 2" slide lock unit (Wilson-Jones B3-367-44). The cover shall be engraved with the job title in 1/2" high letters and the name and address of the Contractor in 1/4" high letters. Provide the same information in 1/8" letters on the spine.
- C. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete lists of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified).
- D. Include the following information where applicable.
 - 1. Identifying name and mark number.
 - 2. Certified outline Drawings and Shop Drawings.
 - 3. Parts lists.
 - 4. Performance curves and data.
 - 5. Wiring diagrams.
 - 6. Light fixture schedule with the lamps and ballast data used on the project for all fixtures
 - 7. Manufacturer's recommended operating and maintenance instructions.
 - 8. Vendor's name and address for each item.
- E. The engineer shall review the manuals and when approved, will forward the manuals on to the architect. If the manuals are rejected twice, the contractor shall reimburse the engineer the sum of \$200.00 for each review afterwards.

1.11 RECORD DRAWINGS:

- A. Maintain, on a daily basis, a complete set of "Record Drawings", reflecting an accurate record of work in accordance with the following:
 - 1. Show the complete routing and location of all feeders rated 100 amps and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.)
 - 2. Show the complete routing and location of all telecommunications conduits, systems raceways, and empty raceways, 1-1/4" and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.).

3. Show all changes, deviations, addendum items, change orders, job instructions, etc., which change the work from that shown on the contract documents, including wall relocations, fixtures and device changes, branch circuiting changes, etc. Where locations of boxes, raceways, equipment, etc. are adjusted in the field to fit conditions, but such new locations may not be obvious by referring to the contract document, show new locations on the record drawings.
- B. At the discretion of the Architect/Engineer, the drawings will be reviewed on a periodic basis and used as a pre-requisite for progress payments. This requirement shall not be construed as authorization for the Contractor to make changes in the layout, or work without written authorization for such changes. The "Record Drawings" for daily recording shall consist of a set of blue line prints of the Contract Drawings.
- C. Upon completion of the work, purchase a complete set of reproducible mylar sepia drawings with the Architect/Engineer's seal and firm name removed or blacked out. Transfer all "Record" information from the blue line prints to the sepias. The sepias shall be reviewed by the Architect/Engineer and the resulting comments shall be incorporated into the final record sepias by the contractor.
- D. Certify the "Record Drawings" for correctness by placing and signing the following certifications of the first sheet of the sepia:
 1. "CERTIFIED CORRECT (3/8" high letters)

(Name of General Contractor)

By _____ Date

(Name of Electrical Contractor)

By _____ Date

1.12 GUARANTEE:

- A. Ensure that electrical system installed under this contract is in proper working order and in compliance with drawings, specifications, and/or authorized changes. Without additional charge, replace any work or materials which develop defect, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

PART 2 – PRODUCTS**2.1 GENERAL:**

- A. Products are specified by manufacturer name, description, and/or catalog number. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor

from meeting the intent of the contract documents nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer who will issue interpretation and/or additional instructions to Bidders before the project is bid.

2.2 MANUFACTURERS:

- A. Provide products of manufacturers specified. Manufacturers catalog numbers and descriptions establish the quality of product required. Substitutions will be considered if a duplicate written application (2-copies) is at the office of the Architect/Engineer eight (8) working days prior to the day of the bidding. The application shall include the following: 1) A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.
- B. Any conflict arising from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.
- C. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.
- D. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued.
- E. Provide only equipment specified in the Contract Documents or approved by addendum.

2.3 SPARE PARTS:

- A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion.

PART 3 – EXECUTION**3.1 INSTALLATION:**

- A. Layout electrical work in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary for proper installation; perform with care. Use skilled mechanics of the trades involved. Repair damage to building and equipment at no additional cost to the contract. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting structural members shall not be permitted.
- B. Since the drawings of floor, wall, and ceiling installation are made at small scale; outlets, devices, equipment, etc., are indicated only in their approximate location unless dimensioned. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned, and coordinate such locations with work of other trades to prevent interferences.

Verify all dimensions on the job. Do not scale the electrical drawings, but refer to the architectural and mechanical shop drawings and project drawings for dimensions as applicable.

- C. Perform for other trades, the electrical wiring and connection for all devices, equipment or apparatus. Consult Architectural, Mechanical, and other applicable drawings, and all applicable shop drawings to avoid switches, outlets, and other equipment from being hidden behind doors, cabinets, counters, heating equipment, etc., or from being located in chalkboards, tackboards, glass panels, etc. Relocate buried electrical devices and/or connections as directed at no additional cost.
- D. Coordinate the location of outlets, devices, connections, and equipment with the supplier of the systems furniture prior to rough-in.
- E. Where conduit, outlets or apparatus are to be encased in concrete, it must be located and secured by a journeyman or foreman present at the point of installation. Check locations of the electrical items before and after concrete and/or masonry installation and relocate displaced items.
- F. Provide block-outs, sleeves, demolition work, etc., required for installation of work specified in this division.

3.2 CLEAN:

- A. Clean up all equipment, conduit, fittings, packing cartons and other debris that is a direct result of the installation of the work of this Division.
- B. Clean fixtures, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

3.3 POWER OUTAGES:

- A. All power outages required for execution of this work shall occur during non-standard working hours and at the convenience of the Owner. Include all costs for overtime work in bid.
- B. Submit written request at least 7 days in advance of scheduled outage and proceed with outage only after receiving authorization from the Owner's Representative.
- C. Keep all outages to an absolute minimum.

3.4 STORAGE AND PROTECTION OF MATERIALS:

- A. Provide storage space for storage of materials and apparatus and assume complete responsibility for all losses due to any cause whatsoever. In no case shall storage interfere with traffic conditions in any public thoroughfare or constitute a hazard to persons in the vicinity. Protect completed work, work underway, and apparatus against loss or damage.

3.5 FIRE PENETRATION SEALS:

- A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after fire. The fire rating of the penetration seal shall be at least that of the floor, wall or ceiling into which it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code. Where applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs, and similar structures. Where applicable, provide 3M fire barrier sealing penetration system, and/or IPC Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps, and other accessories as required. All materials to comply with UL 1479 (ASTM E-814). Comply with manufacturer's instructions and recommendations for installation of sealing fittings and barrier sealing systems.

3.6 PROJECT FINALIZATION AND START-UP:

- A. Upon completion of equipment and system installation, assemble all equipment Factory Representatives and Subcontractors for system start-up.
- B. Each Representative and Subcontractor shall assist in start-up and check out their respective system and remain at the site until the total system operation is accepted by the Owner's representative.
- C. The Factory Representative and/or System Subcontractor shall give personal instruction on operating and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:
- D. This is to certify that the Factory Representative and System Subcontractor for each of the systems listed below have performed start-up and final check out of their respective systems.
- E. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system.

1. SYSTEM

(List systems included)

Owner's RepresentativeFACTORY REPRESENTATIVE(List name and address of
Factory Representative)._____
Contractor

- F. Send copy of acceptance to Architect/Engineer.

3.7 FINAL REVIEW:

- A. At the time of final review, the project foreman shall accompany the reviewing party, and remove coverplates, panel covers and other access panels as requested, to allow review of the entire electrical system.

END OF SECTION 16001

SECTION - 16070 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to electrical connections.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical connection for equipment includes final electrical connection of all equipment having electrical requirements. Make final connections for all owner furnished equipment. See other applicable portions of specification for building temperature control wiring requirements.
- B. Refer to Division-15 sections for motor starters and controls furnished integrally with equipment; not work of this section.
- C. Refer to Division-15 section for control system wiring; not work of this section.
- D. Refer to sections of other Divisions for specific individual equipment power requirements.

1.3 QUALITY ASSURANCE:

- A. **NEC COMPLIANCE:** Comply with applicable portions of NEC as to type products used and installation of electrical power connections.
- B. **UL LABELS:** Provide electrical connection products and materials which have been UL-listed and labeled.

PART 2 – PRODUCTS

2.1 GENERAL:

- A. For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, raceways, conductors, cords, cord caps, wiring devices, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices, terminations, and connections as required. Crimp on or slip-on type splicing materials (insulation displacement type) designed to be used without wire stripping are not acceptable. See Section 16110, Conduit Raceways; Section 16140 Wiring Devices; and Section 16120 Wire and Cable for additional requirements. Provide final connections for equipment consistent with the following:

- B. Permanently installed fixed equipment - flexible seal-tite conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.
- C. Movable and/or portable equipment - wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).
- D. Other methods as required by the National Electrical Code and/or as required by special equipment or field conditions.

PART 3 – EXECUTION**3.1 INSTALLATION OF ELECTRICAL CONNECTIONS:**

- A. Make electrical connections in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams.
- C. Coordinate installation of electrical connections for equipment with equipment installation work.
- D. Verify all electrical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under other Divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review equipment electrical characteristics. Report any variances from electrical characteristics noted on the electrical drawings to Architect before proceeding with rough-work.
- E. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.
- F. Refer to basic materials and methods Section 16120, Conductors, for identification of electrical power supply conductor terminations.

END OF SECTION 16070

SECTION 16080 – DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Provisions, Division 1 and Division-2A Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to demolition.

1.2 DESCRIPTION OF WORK:

- A. Extent of major items of demolition work is indicated by drawings. Other demolition work shall be performed as required to maintain system operation.
- B. The intent of the drawings is to indicate major items affected and not to show every device, outlet, fixture, etc. affected by demolition work.
- C. The drawings do not necessarily reflect as-built conditions. The contractor shall visit the jobsite prior to bidding to determine the overall scope of demolition work.
- D. Refer to sections of other Divisions for applicable requirements affecting demolition work.
- E. Refer to Section 16001 for requirements with regard to power outages affecting the operation of existing electrical systems.

1.3 QUALITY ASSURANCE:

- A. NEC COMPLIANCE:
 - 1. Comply with applicable portions of NEC as to methods used for demolition work.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Demolition work shall be laid out in advance to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary, perform with care, use skilled mechanics of the trades involved. Repair damage to building and equipment. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting of structural members shall not be permitted.

2.2 PATCHING AND REPAIR

- A. The Contractor is responsible for all demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (painted, etc.) to match the adjacent materials, finishes and colors.

- B. Hard surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it shall be the responsibility of this contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, roofing, etc.
- C. The method of patching and repair shall follow good construction practices and all finished surfaces shall match materials and finish wherein the demolition occurred.

2.3 EXISTING EQUIPMENT

- A. The following is a part of this project and all costs pertaining thereto shall be included in the base bid.
- B. The new electrical equipment and apparatus shall be coordinated and connected into the existing system as required. Auxiliary systems shall comply, unless otherwise specified.
- C. The existing electrical devices, conduit and/or equipment that for any reason obstructs construction shall be relocated. Provide conduit, wiring, junction boxes, etc. as required to extend existing circuits and systems to relocated devices or equipment.
- D. The new fixtures indicated for existing outlets shall be installed in accordance with the fixture specifications.
- E. When installing equipment in the existing building, it shall be concealed.
- F. All existing electrical equipment and systems in portions of the building not being remodeled shall be kept operational, in service and in working condition throughout the entire construction period. Restore any circuits and systems interrupted. Provide temporary panels, temporary wiring and conduit, etc. as required.
- G. Maintain circuit integrity and continuity of all existing circuits and systems that interfere with or are interrupted by remodel work unless those circuits are to be abandoned completely. Maintain all circuits and systems in operation during construction. Provide temporary panels, temporary wiring and conduit, etc. as required.
- H. Existing raceways may be used where possible in place, except as noted. All circuits, conduit and wire that are not used in the remodeled area shall be removed back to the panelboard, where it shall be labeled a spare with circuit number indicated. Re-used raceway shall meet all requirements for new installations.
- I. The existing light fixtures which are not used in the remodeled area shall be properly disposed of.
- J. Obtain permission from the Architect and Owner's representative before penetrating any ceiling, floor, and wall surfaces.
- K. Any and all equipment having electrical connections that require disconnecting and reconnection at the same or another location throughout the course of construction shall be included as part of this contract.

END OF SECTION 16080

SECTION 16110 - CONDUIT RACEWAYS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to electrical raceways and specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of raceways is indicated by drawings and schedules.
- B. Types of raceways in this section include the following:
 - 1. Electrical Metallic Tubing
 - 2. Flexible Metal Conduit
 - 3. Liquid-tight Flexible Metal Conduit

1.3 QUALITY ASSURANCE:

- A. **MANUFACTURERS:** Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.
- B. **STANDARDS:** Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components which have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.
- C. **SUBMITTALS:** Not required.

PART 2 – PRODUCTS

2.1 METAL CONDUIT AND TUBING:

- A. **GENERAL:**
 - 1. Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4", minimum trade size for telephone/data of 1".
- B. **ALUMINUM CONDUIT:** Not acceptable.
- C. **MC CABLE:** Not acceptable.

- D. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.
- E. EMT FITTINGS:
 - 1. Provide insulated throat nylon bushings with non-indenter type malleable steel fittings at all conduit terminations. Install OZ Type B bushings on conduits 1" larger. Cast or indenter type fittings are not acceptable.
- F. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type;
 - 1. Zinc-coated steel.
- G. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 1, and Style A.
- H. LIQUID TIGHT FLEXIBLE METAL CONDUIT:
 - 1. Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).
- I. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3, Style G.
- J. EXPANSION FITTINGS: OZ Type AX, or equivalent to suit application.

2.2 CONDUIT; TUBING; AND DUCT ACCESSORIES:

- A. Provide conduit, tubing and duct accessories of types and sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing. Provide manufactured spacers in all duct bank runs.

2.3 SEALING BUSHINGS:

- A. Provide OZ Type FSK, WSK, or CSMI as required by application. Provide OZ type CSB internal sealing bushings.

2.4 CABLE SUPPORTS:

- A. Provide OZ cable supports for vertical risers, type as required by application.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL RACEWAYS:

- A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following:

CONDUIT RACEWAYS

1. BRANCH CIRCUITS, SIGNAL AND CONTROL CIRCUITS, AND INDIVIDUAL EQUIPMENT CIRCUITS RATED LESS THAN 100 AMPS:
 - a. Install in electric metallic tubing (EMT).
- B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
- C. Install raceway in accordance with the following:
 1. Provide a minimum of 12" clearance measured from outside of insulation from flues, steam and hot water piping, etc. Avoid installing raceways in immediate vicinity of boilers and similar heat emitting equipment. Conceal raceways in finished walls, ceilings and floor (other than slab-on-grade), except in mechanical, electrical and/or communication rooms, conceal all conduit and connections to motors, equipment, and surface mounted cabinets unless exposed work is indicated on the drawings. Run concealed conduits in as direct a line as possible with gradual bends. Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines. Do not install lighting raceway until piping and duct work locations have been determined in order to avoid fixtures being obstructed by overhead equipment.
 2. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway. Paint all field threads (or portions of raceway where corrosion protection has been damaged) with primer and enamel finish coat to match adjacent raceway surface.
- D. Comply with NEC for requirements for installation of pull boxes in long runs.
- E. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandril and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.
- F. Replace all crushed, wrinkled or deformed raceway before installing conductors.
- G. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.
- H. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.
- I. Provide OZ cable supports in all vertical risers in accordance with NEC 300-19; type as required by application.
- J. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.

END OF SECTION 16110

SECTION 16120 - CONDUCTORS AND CABLES (600V AND BELOW)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to conductors and cables specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical conductor and electrical cable work is indicated by drawings and schedules.
- B. Types of conductors and cables in this section include the following:
 - 1. Copper Conductors (600V)
- C. Applications for conductors and cables required for project include:
 - 1. Branch Circuits

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical conductors and cable. Comply with UL standards and provide electrical conductors and cables which have been UL-listed and labeled.
- B. Comply with applicable portions of NEMA/Insulated Cable Engineers Association standards pertaining to materials, construction and testing of conductors and cable.
- C. Comply with applicable portions of ANSI/ASTM and IEEE standards pertaining to construction of conductors and cable.

1.4 SUBMITTALS:

- A. FIELD TEST DATA:
 - 1. Submit megohmmeter test data for circuits under 600 volts.

PART 2 - PRODUCTS

2.1 COPPER CONDUCTORS (600V):

- A. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:

1. Distribution and Panelboard Feeders; and Other Conductors, #2 AWG and Larger – Copper conductor; see drawings for insulation type.
 2. Branch Circuit Conductors and All Conductors #3 AWG and Smaller - Copper conductor, with THHN/THWN insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG. Provide stranded conductors for #8 AWG and larger.
- B. Provide color and coding of conductors as follows:
- 120/208V
- A-Phase - Black
- B-Phase - Red
- C-Phase - Blue
- Neutral - White
- Ground - Green
- C. Provide colors for switch legs, travelers and other wiring for branch circuits different than listed above.
- D. Provide #10 AWG neutral conductor for all three and four wire fluorescent circuit home runs.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install electric conductors and cables as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in accordance with recognized industry practices.
- B. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.
- C. Cables may be pulled by direct attachment to conductors or by use of basket weave pulling grip applied over cables. Attachment to pulling device shall be made through approved swivel connection. Nonmetallic jacketed cables of small size may be pulled directly by conductors by forming them into a loop to which pull wire can be attached; remove insulation from conductors before forming the loop. Larger sizes of cable may be pulled by using basket weave pulling grip, provided the pulling force does not exceed limits recommended by manufacturer; if pulling more than one cable, bind them together with friction tape before applying the grip. For long pulls requiring heavy pulling force, use pulling eyes attached to conductors.
- D. Do not exceed manufacturer's recommendations for maximum allowable pulling tension, side wall pressure, and minimum allowable bending radius. In all cases, pulling tension applied to the

conductors shall be limited to 0.008 lbs. per circular mil of conductor cross-section area.

- E. Pull in cable from the end having the sharpest bend; i.e. bend shall be closest to reel. Keep pulling tension to minimum by liberal use of lubricant, and turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one in pullhole during this operation.
- F. For training of cables, minimum bend radius to inner surface of cable shall be 12 times cable diameter.
- G. Where cable is pulled under tension over sheaves, conduit bends, or other curved surfaces, make minimum bend radius 50% greater than specified above for training.
- H. Use only wire and cable pulling compound recommended by the specific cable manufacturer, and which is listed by UL.
- I. Seal all cable ends unless splicing is to be done immediately. Conduit bodies shall not contain splices.
- J. Follow manufacturer's instructions for splicing and cable terminations.

3.2 AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW:

- A. Prior to energization, test cable and wire for continuity of circuitry, and for short circuits, Megger all circuits of 100 amp and greater rating. Correct malfunctions. Submit record in triplicate of megohmmeter readings to Architect/Engineer.
- B. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 16120

SECTION 16135 - ELECTRICAL BOXES AND FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is a part of each Division-16 section making reference to electrical wiring boxes and fittings specified herein. See Section 16110, Raceways, for additional requirements.

1.2 DESCRIPTION OF WORK:

- A. The extent of electrical box and electrical fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings in this section include the following:
 - 1. Outlet Boxes
 - 2. Junction Boxes
 - 3. Pull Boxes
 - 4. Conduit Bodies
 - 5. Bushings
 - 6. Locknuts
 - 7. Knockout Closures
 - 8. Miscellaneous Boxes and Fittings

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical boxes and fittings. Comply with ANSI C 134,1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports. Provide electrical boxes and fittings which have been UL-listed and labeled.

1.4 SUBMITTALS: None required

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS:

- A. INTERIOR OUTLET BOXES:
 - 1. Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes with accessory rings, of types, shapes and sizes, including box depths, to suit each respective location and installation, construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box and covers and wiring devices; minimum size 4"x4"x1-1/2". Provide minimum 2-1/8" depth for boxes with three or more conduit entries.

2. Provide an 'FS' box, with no knockouts when surface mounted in a finished, non-utility space. Surface mounting is only acceptable when approved by the Architect.

B. INTERIOR OUTLET BOX ACCESSORIES:

1. Provide outlet box accessories as required for each installation, including mounting brackets, hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring applications.

C. WEATHERPROOF OUTLET BOXES:

1. Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes (including depth) required, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, with face plate gaskets and corrosion-resistant fasteners.

D. JUNCTION AND PULL BOXES:

1. Provide code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

E. CONDUIT BODIES:

1. Provide galvanized cast-metal conduit bodies, of types, shapes and sizes to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.

F. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS:

1. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable steel conduit bushings and offset connectors, of types and sizes to suit respective uses and installation.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. GENERAL:

1. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
2. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

3. Provide coverplates for all boxes. See Section 16140, Wiring Devices.
4. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
5. Provide knockout closures to cap unused knockout holes where blanks have been removed.
6. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Do not install boxes above ducts or behind equipment. Install recessed boxes with face of box or ring flush with adjacent surface. Seal between switch, receptacle and other outlet box openings and adjacent surfaces with plaster, grout, or similar suitable material.
7. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10" of conduit between them.
8. Provide electrical connections for installed boxes.

END OF SECTION 16135

SECTION 16136 - SUPPORTING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is a part of each Division-16 section making reference to supports, anchors, sleeves, and seals, specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of supports, anchors, and sleeves is indicated by drawings and schedules and/or specified in other Division-16 sections. See Section 16110, Raceways, for additional requirements.
- B. Work of this section includes supports, anchors, sleeves and seals required for a complete raceway support system, including but not limited to: clevis hangers, riser clamps, C-clamps, beam clamps, one and two hole conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, threaded rods and all associated accessories.

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical supporting devices. Comply with applicable requirements of ANSI/NEMA Std. Pub No. FB 1, "Fittings and Supports for Conduit and Cable Assemblies". Provide electrical components which are UL-listed and labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES:

- A. GENERAL:
 - 1. Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. See drawings for additional requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES:

- A. Install hangers, anchors, sleeves, and seals as required, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structures. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. For pre-and post tensioned construction, use pre-set inserts for support of all electrical work. Do not use toggle bolts, moly bolts, wood plugs or screws in sheetrock or plaster as support for any equipment or raceway.

D. RACEWAYS:

1. Support raceways which are rigidly attached to structure at intervals not to exceed 8 feet on center, minimum of two straps per 10 foot length of raceway, and within 12" of each junction box, coupling, outlet or fitting. Support raceway at each 90 degree bend. Support raceway (as it is installed) in accordance with the following:

<u>NUMBER OF RUNS</u>	<u>3/4" TO 1-1/4" Ø</u>	<u>1-1/2" & LARGER Ø</u>
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1	Full straps, clamps or hangers.	Hanger
2	Full straps, clamps or hangers.	Mounting Channel
3 or more	Mounting Channel	Mounting Channel

2. Support suspended raceways on trapeze hanger systems; or individually by means of threaded rod and straps, clamps, or hangers suitable for the application. Do not use "wire" as a portion of any raceway support system; do not support raceway from ceiling support wires.

END OF SECTION 16136

SECTION 16140 - WIRING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - 1. Receptacles
 - 2. Switches

1.3 QUALITY ASSURANCE:

- A. Comply with NEC and NEMA standards as applicable to construction and installation of electrical wiring devices. Provide electrical wiring devices which have been UL listed and labeled.

1.4 SUBMITTALS:

- A. PRODUCT DATA:
 - 1. Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

- A. FABRICATED WIRING DEVICES:
- B. GENERAL:
 - 1. Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub No. WD 1.
 - 2. Provide wiring devices (of proper voltage rating) as follows:

<u>MFGR.</u>	<u>RECEPTACLE</u>	<u>SWITCHES</u>			
		<u>1-POLE</u>	<u>3-WAY</u>	<u>4-WAY</u>	<u>W-PILOT</u>
Hubbell	HBL5352	HBL 1221	HBL 1223	HBL1224	HBL1221-PL
Bryant	5352	1221	1223	1224	1221-PL
Pass Seymour	5352	20AC1	20AC3	20AC4	20AC1-RPL
Leviton	5362	1221	1223	1224	
Cooper	5352	1221	1273	1224	1221-PL

3. Provide devices in colors selected by Architect. Provide red devices on all emergency circuits.

C. TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) RECEPTACLES:

1. Provide TVSS receptacles having 4 series parallel 130V MOV's capable of a minimum of 140 joules suppression. Provide units with visual (and audible) surge status indicators to monitor condition of surge circuit; visual indicator to be "on" when power present and suppression circuit is fully functional. (Audible indicator shall sound a "beep" alarm approximately every 30 seconds if suppression circuit has been damaged.) Provide NEMA 5-20R, 20 amp, 125V receptacle of one of the following manufacturers:

MANUFACTURER

<u>SPECIFICATION GRADE</u>	<u>HUBBELL</u>	<u>PASS SEYMOUR</u>
Duplex Recept-Visual only	5350	5352 XXXSP
Duplex Recept-Visual/Audible	5352	5362 XXXSP
Single Recept-Visual only	5351	N/A
Duplex Recept-Isol Gnd, Visual/Audible	IG5352S	IG5362 XXXSP
Single Recept-Isol Gnd, Visual only	IG5351S	N/A

HOSPITAL GRADE

Duplex Recept-Visual/Audible	8300HS	8300 XXXSP
Single Recept-Visual only	8310HS	N/A
Duplex Recept-Isol Gnd, Visual/Audible	IG8300HS	IG8300 XXXSP
Single Recept-Isol Gnd, Visual only	IG8310HS	N/A

2. Color of devices selected by Architect. Provide red devices on all emergency circuits.

D. GROUND-FAULT INTERRUPTER:

1. Provide general-duty, duplex receptacle, ground-fault circuit interrupters; feed-thru types, capable of protecting connected downstream receptacles on single circuit; grounding

type UL-rated Class A, Group A, 20-amperes rating; 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; color as selected by Architect. Provide Hospital grade where required elsewhere by specification or drawings. Provide units of one of the following:

- a. P&S/Sierra
- b. Hubbell
- c. Leviton
- d. Square D

E. WIRING DEVICE ACCESSORIES:

1. WALL PLATES:

- a. Provide coverplates for wiring devices. Provide stainless steel coverplates in all finished areas. Provide galvanized steel plates in unfinished areas. Provide blank coverplates for all empty outlet boxes. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics. Example "208V, 30A".

F. WEATHER-PROTECTING DEVICE ENCLOSURES:

- 1. Where required for compliance with NEC 406-8 (receptacles installed outdoors for use other than with portable tools or equipment), provide weather-tight device covers which provide complete protection with the cord and cap inserted into the wiring device. Provide units which mount on either single or double gang devices. Provide device enclosures manufactured by one of the following:
 - a. Intermatic WP1020 or WP1030
 - b. P&S WIUC10C or WIUC20c

PART 3 – EXECUTION

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work. Install devices in boxes such that front of device is flush and square with coverplate. Drawings are small scale and, unless dimensioned, indicate approximate locations only of outlets, devices, equipment, etc. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings before beginning rough-in of electrical work. Adjust locations of all electrical outlets as required to accommodate work in area, and to avoid conflicts with wainscoat, back splash, tackboards, and other items.
- C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris. Mark each device box (for each type of wiring device) with a

permanent ink felt tip marker, indicating the circuit to which the device is connected. Example: "CKT A-1".

- D. Install blank plates on all boxes without devices.
- E. Delay installation of wiring devices until wiring work and painting is completed. Provide separate neutral conductor from panel to each GFI receptacle.
- F. Install GFI receptacles for all receptacles installed in restrooms, kitchens, outdoors or within six feet of any sink. Provide in elevator equipment rooms and pits.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES:

- A. At time of substantial completion, replace those items, which have been damaged, including those stained, burned and scored.

3.3 GROUNDING:

- A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.4 TESTING:

- A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 16140

SECTION 16170 - MOTOR AND CIRCUIT DISCONNECTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to motor and circuit disconnect switches specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of motor and circuit disconnect switch work is indicated by drawings and schedule. Work includes complete installations and electrical connections.

1.3 QUALITY ASSURANCE:

- A. Provide motor and circuit disconnect switches which have been UL listed and labeled. Comply with applicable requirements of NEMA Standards Pub. No. KS 1, and NEC.

1.4 SUBMITTALS:

- A. **PRODUCT DATA:** Submit manufacturer's data including specifications, installation and general recommendations, for each type of motor and circuit disconnect switch required.
- B. **SHOP DRAWINGS:** Submit dimensioned drawings of electrical motor and circuit disconnect switches which have rating of 100 amperes and larger.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. **MANUFACTURER:** Subject to compliance with requirements, provide products of one of the following (for each type of switch):
 - 1. Square D Company

2.2 FABRICATED SWITCHES:

- A. **GENERAL:** Provide disconnect and safety switches as indicated herein. Provide:
 - 1. General duty switches on 240 Volt rated circuits.
 - 2. Heavy duty switches on 480 volt rated circuits.
 - 3. HP rated switches on all motor circuits.
- B. **GENERAL DUTY SWITCHES:** Provide general-duty type, sheet-steel enclosed switches, fusible or non-fusible as indicated of types, sizes and electrical characteristics indicated; rated

240 volts, 60 hertz; incorporating spring assisted, quick-make, quick-break mechanisms. Provide single phase or three phase and with solid neutral as required by application. Equip with operating handle which is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application, unless noted. Provide fusible switches with Class R rejection fuse clip kits.

- C. **HEAVY-DUTY SWITCHES:** Provide heavy-duty type, sheet-steel enclosed safety switches, fusible or non-fusible as indicated, of types, sizes and electrical characteristics indicated; rated 600 volts, 60 hertz; incorporating quick-make, quick-break type mechanisms. Provide single phase or 3 phase, and with solid neutral as required by application, Equip with operating handle which is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application unless noted. Provide fusible switches with Class R rejection fuse clip kits.
- D. **FUSES:** Provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for service indicated. Provide spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size. See Section 16180 Overcurrent Protective Devices for fuse types.
- E. **IDENTIFICATION:** Provide 1/16" thick black plastic laminate labels with 1/4" high lettering on the exterior of each disconnect. Provide red plastic laminate labels on disconnects supplied with emergency power.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES:

- A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- C. Install disconnect switches used with motor driven appliances, and motors and controllers within sight of controller position.

END OF SECTION 16170

SECTION 16180 - OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of overcurrent protective device work is indicated by drawings and schedules and specified herein. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures; and for installation as integral components of switchboard and panelboards. See Section 16175, Switchgear and Switchboards, and Section 16160, Panelboards.
- B. Types of overcurrent protective devices in this section include the following for operation at 600 Volts and below:
 - 1. Molded case circuit breakers
 - 2. Fusible switches
 - 3. Fuses
- C. Refer to other Division-16 sections for cable/wire and connector work required in conjunction with overcurrent protective devices.

1.3 QUALITY ASSURANCE

- A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent devices.

1.4 SUBMITTALS:

- A. **PRODUCT DATA:** Submit manufacturer's data on overcurrent protective devices, including catalog cuts, time-current trip characteristic curves, and mounting requirements.
- B. **SHOP DRAWINGS:** Submit layout drawings of overcurrent protective devices, with layouts of circuit breakers, including spatial relationships to proximate equipment. Failure to submit said spatial layouts does not relieve contractor of responsibility to verify all required clearances before release of equipment for fabrication.
- C. **MAINTENANCE STOCK, FUSES:** For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than two units of each size and type, unless specified otherwise in another section of these specifications.

PART 2 – PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS:**

- A. Subject to compliance with requirements, provide products of one of the following (main and branch device manufacturer must be same as panelboard and/or switchboard manufacturer):
- B. CIRCUIT BREAKERS AND FUSIBLE SWITCHES:
 - 1. Square D Co.
- C. MOLDED CASE CIRCUIT BREAKERS:
 - 1. Provide factory-assembled, molded case circuit breaker for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers of amperage, voltage, and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Series rated systems are not acceptable. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with mechanical screw type removable connector lugs, AL/CU rated, of proper size to accommodate conductors specified.
- D. FUSIBLE SWITCHES:
 - 1. Provide factory-assembled fusible switch units for power distribution panelboards and switchboards, and individual mounting as indicated. Provide switch units of amperage, voltage, and RMS interrupting rating as shown, with quick-make, quick-break mechanisms, visible blades and dual horsepower ratings. Series rated systems are not acceptable. Equip with lockable handles with on-off indication. Interlock switch covers and handles to prevent opening in "ON" position. Provide switch with Class R rejection fuse clip kits. Provide AL/CU rated lugs of proper size to accommodate conductors specified.

2.2 FUSES

- A. GENERAL: Except as otherwise indicated, provided fuses of type, sizes and ratings and electrical characteristics of a single manufacturer as follows. Provide fuses labeled UL Class L or UL Class R, current limiting and rated for up to 200,000 amperes. Provide Buss KAZ signal activating fuses where required elsewhere in specification.
- B. Where fuses are shown feeding individual or groups of equipment items, comply with manufacturer's recommendation for fusing; adjust fuse size and type as necessary to comply with manufacturer's recommendation.
- C. Provide and install spare fuse cabinet in main electrical room.
- D. MAIN SERVICE AND FEEDER CIRCUITS: For fuse ratings over 600 amperes provide UL Class L Fuses (KRP-C, or A4BQ or LCL or KLPC). For fuse ratings up to 600 amperes, provide

UL Class RK1 (KTN-R, KTS-R or A2K-R, A6K-R or NCCR, SCLR or KLN-R, KLS-R). If fuse directly feeds motors, transformers or other inductive load provide UL RK5 time delay (FRN-R, FRS-R or TR-R, TRS-R or ECN-R, ECS-R or FLN-R, FLS-R).

- E. BRANCH CIRCUITS: For motor circuits, transformer circuits, or other inductive loads, provide UL Class RK5 (FRN-R, FRS-R or TR-R, TRS-R or ECN-R, ECN-S or FLN-R, FLS-A). For other circuits, provide UL Class RK1, (KTN-R, KTS-R OR A2K-R, A6K-R or NCLR, SCLR OR KLN-R, KLSR).
- F. MANUFACTURER: Subject to compliance with requirements, provide fuses of one of the following:
 - 1. Bussman Mfg. Co.
 - 2. Gould Shawmut, Gould Electric Fuse Division
 - 3. Reliance Fuse Div./Brush Fuse Inc.
 - 4. Littlefuse, Inc.
- G. IDENTIFICATION: Provide 1/16" thick black plastic laminate labels with 1/4" high lettering on the exterior of all overcurrent devices which are furnished in separately mounted enclosures. Provide red labels for devices supplied with emergency power.

PART 3 – EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES:

- A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
- B. Coordinate with work as necessary to interface installations of overcurrent protective devices with other work.
- C. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.
- D. Install fuses in overcurrent protective devices. For motor circuits, fuse sizes shown on drawings are for general guidance only. Size fuses in accordance with fuse manufacturer's recommendation for given motor nameplate ampere rating. Test operation. If nuisance tripping occurs, increase fuse size and disconnect device (if necessary) as required to provide nuisance free tripping. Adjust fuse size properly for ambient temperature, frequent starting and stopping of motor loads, and for loads with long start times. Include all costs in bid.
- E. Field test all ground fault protective devices for proper operation; test to be performed by representative of the manufacturer. Include verification of complete time current trip characteristics.

3.2 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and

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for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 16180

SECTION 16452 - GROUNDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Provide grounding as specified herein, and as indicated on drawings.
- B. Provide grounding and bonding of all electrical and communication apparatus, machinery, appliances, building components, and items required by the NEC to provide a permanent, continuous, low impedance, grounding system.
- C. Unless otherwise indicated, ground the complete electrical installation including the system neutral, metallic conduits and raceways, boxes, fittings, devices, cabinets, and equipment in accordance with all code requirements.
- D. Ground each separately derived system, as described in NEC Section 250-30, unless otherwise indicated.
- E. Types of grounding in this section include the following:
 - 1. Grounding Electrodes
 - 2. Enclosures
 - 3. Systems
 - 4. Equipment
 - 5. Other items indicated on drawings
- F. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to electrical grounding and ground fault protection systems. Comply with applicable ANSI and IEEE requirements. Provide products which have been UL listed and labeled.
- B. Resistance from the service entrance ground bus, through the grounding electrode to earth, shall not exceed 5 ohms.

1.4 SUBMITTALS:

- A. Submit the name of test agency to be used for testing specified in this section. Submit results of

tests specified in this section. Also include test results in Operation and Maintenance Manuals as specified.

PART 2 – PRODUCTS

2.1 MATERIALS AND COMPONENTS:

- A. **GENERAL:** Except as otherwise indicated, provide each electrical grounding system as specified herein, and as shown on drawings, including but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.
- B. **ELECTRICAL GROUNDING CONDUCTORS:** Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC. Provide with green insulation.
- C. **INSULATED GROUNDING BUSHINGS:** Plated malleable iron body with 150 degree Centigrade molded plastic insulating throat, lay-in grounding lug with hardened stainless steel fasteners, OZ/Gedney BLG, or Thomas & Betts #TIGB series.

PART 3 - EXECUTION

3.1 INSTALLATION OF GROUNDING SYSTEMS:

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding devices comply with requirements.
- B. Install clamp-on connectors only on thoroughly cleaned and metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- C. Provide grounding for the entire raceway, enclosure, equipment and device system in accordance with NEC. All raceways shall include copper grounding conductor sized in accordance with NEC.

3.2 GROUNDING ELECTRODES:

- A. **EQUIPMENT BONDING/GROUNDING:** Provide a NEC sized conductor, whether indicated or not on the drawings, in raceways as follows:
 - 1. Non-metallic conduits and ducts.
 - 2. Distribution feeders.
 - 3. Motor and equipment branch circuits.
 - 4. Device and lighting branch circuits.
 - 5. Provide grounding bushings and bonding jumpers for all conduit terminating in reducing washers, concentric, eccentric or oversized knockouts at panelboards, cabinets and gutters.

- B. Provide bonding jumpers across expansion and deflection couplings in conduit runs, across pipe connections at water meters, and across dielectric couplings in metallic cold water piping system.
- C. Provide bonding wire in all flexible conduit.

3.3 TESTING:

- A. Obtain and record ground resistance measurements both from service entrance ground bus to the ground electrode and from the ground electrode to earth. Install additional bonding and grounding electrodes as required to comply with resistance limits specified under this Section.
- B. Include typewritten records of measured resistance values in the Operation and Maintenance Manual.
- C. Use independent testing agency for all testing.
- D. Use test equipment expressly designed for the purpose intended. Submit name of testing agency for review and approval, in writing, to the Engineer prior to the performance of any testing.

END OF SECTION 16452

SECTION 16510 - INTERIOR AND EXTERIOR BUILDING LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Types of lighting fixtures in this section are indicated by schedule and include the following:
 - 1. High-Intensity-Discharge (HID)
 - 2. Fluorescent
 - 3. Incandescent/Halogen
 - 4. LED (Light Emitting Diode)

1.3 QUALITY ASSURANCE:

- A. Comply with NEC, NEMA and ANSI 132,1 as applicable to installation and construction of lighting fixtures. Comply with NEC 410-65C for all recessed incandescent light fixtures. Provide lighting fixtures which have been UL-listed and labeled.

1.4 SUBMITTALS:

- A. **PRODUCT DATA:**
 - 1. Submit manufacturer's data on interior and exterior building lighting fixtures.
- B. **SHOP DRAWINGS:**
 - 1. Submit dimensioned drawings of lighting fixtures. Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet. Submit all available standard color samples with the shop drawings. If standard colors are not acceptable, a color sample will be provided to the fixture manufacturer. Return of the shop drawings will be delayed until color samples are provided. Submit ballast manufacturer cut sheets. Submit a list of all lamps used on all projects.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (for each type of fixture):

1. HID MAGNETIC BALLASTS:
 - a. Advance Transformer Co.
 - b. Universal Lighting Technologies Co.
 - c. Venture Lighting International
2. INCANDESCENT AND FLUORESCENT LAMPS:
 - a. General Electric Co.
 - b. Osram Sylvania
 - c. Phillips Lighting Corp.

2.2 INTERIOR AND EXTERIOR LIGHTING FIXTURES:**A. GENERAL:**

1. Provide lighting fixtures, of sizes, types and ratings indicated complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters, and wiring. Label each fixture with manufacturer's name and catalog number. Provide all enclosed fixtures with positive latch mechanisms; spring tension clips not acceptable. Provide all exterior fixtures with damp or wet location label as required by application.

B. SUPPORT REQUIREMENTS:

1. Provide all pendant and stem hung fixtures with flexible ball joint hangers at all points of support. Equip hooks used to hang fixtures with safety latches. Provide all detachable fixture parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain, or safety cable.
2. Comply with manufacturer's written recommendations for all lamp ballast combinations.
3. Equip outdoor fixtures with low temperature starting ballasts.

C. CBM LABELS:

1. Provide fluorescent-lamp ballasts, which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

D. FLUORESCENT LAMP BALLASTS: - (ELECTRONIC):

1. Provide rapid start, fluorescent lamp ballasts capable of operating lamp types indicated, with power factor (ratio of actual power to apparent power) above 95%, and operating with audible noise level lower than the quietest C.B.M. certified ballast for the same application, listed as class A. Provide ballasts which comply with applicable state, federal, and industry standards and:
 - a. Are UL listed,
 - b. Comply with FCC requirements governing electromagnetic and radio frequency interference.

- c. Comply with IEEE standards for line voltage transient protection, and ANSI C.62.41 for location director A3 in the normal mode and location category A1 in the common mode.
 - d. Comply with ANSI and IEEE standards for harmonic distortion
- 2. Light output shall not vary by more than 1% over a plus or minus 10% variation in line voltage, and shall not vary more than 5% of light output of equivalent C.B.M. certified ballast. See drawings and schedules for input voltage requirements. Ballasts shall consistently start and operate lamps from a supply line voltage of plus or minus 10% from nominal line voltage.
- 3. Provide ballasts which operate at a frequency above 20K hz from an input frequency of 60 hz; have an efficacy factor (relative light output per watt consumed) at least 10% above the C.B.M. certified electromagnetic system for the same application; and have a lamp crest factor (ratio of peak to R.M.S. lamp current) of 1.7 or less. Ballasts shall have a total current harmonic distortion of less than 20%.
- 4. All T5 and Compact electronic ballasts shall be programmed rapid start for maximum lamp life on shorter start cycles. Filament voltage shall be applied prior to the application of open circuit voltage to allow adequate heating of the filaments and then open circuit voltage is applied to start the lamps. Ballasts shall provide for a minimum lamp starting temperature of 0 degrees F. T8 ballasts shall be rapid start unless specified on the fixture schedule otherwise.
- 5. Ballasts for lamps of T5, T4, and T2 diameter shall contain end-of-life sensing circuitry to prevent lamp, lamp base, or socket damage at end-of-life.
- 6. Ballast manufacturer shall warrant ballasts for T8 and T5 lamps to be free from defects in material or workmanship for at least 5 years from date of manufacture. Ballasts for T4 and smaller shall be 3 years. Contractor shall provide warrantee in accordance with other sections of this specification. Warranty shall include an allowance for nominal replacement labor and replacement of defective product.
- 7. Comply with manufacturer's written recommendations for all lamp ballast combinations. Provide electronic ballasts of one of the following:
 - a. Motorola
 - b. Advance Transformer Company
 - c. Howard Industries
 - d. Osram Sylvania
 - e. Universal Lighting Technologies Co.

E. CBM LABELS:

- 1. Provide fluorescent-lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

F. FLUORESCENT LAMPS:

1. Equip interior fluorescent fixtures with full light output, T8 lamps where available as standard products. Where applicable, equip fixtures with lamps as follows:

4' T8 2950 Initial Lumens

- a. Sylvania Octron
 - b. General Electric
 - c. Phillips.
2. Provide fluorescent lamps with low levels of mercury, capable of acceptance of the Environmental Protection Agency (EPA) through the TCLP (Toxic Characteristic Leaching Procedure).

G. DIFFUSERS:

1. Where plastic diffusers are specified, provide 100 percent virgin acrylic compound; minimum thickness, .125 inches.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standards of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
- B. Coordinate with other work as appropriate to properly interface installation of lighting fixtures with other work. Consult architectural reflected ceiling plan for exact location of all lighting fixtures.
- C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of fixtures. Support all ceiling mounted fixtures from the building structure; independent of the ceiling system, unless noted. Support each recessed fixture (fluorescent incandescent, and/or HID) from the building structure with #12 ga. steel wire attached to each corner (in addition to supports normally provided for attachment to the ceiling system). Provide backing supports above (or behind) sheetrock, plaster and similar ceiling and wall materials. Support surface mounted ceiling fixtures from channel. Support ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. Feed each recessed fixture directly from an outlet box with flex conduit as required; do not loop from fixture to fixture. See plans for additional details.
- D. Provide each lay-in light fixture with at least 36" (Not to exceed 72") of 3/8" steel flexible conduit.
- E. Coordinate lighting in mechanical room with duct and equipment locations.
- F. Provide gypsum board protection as required, (acceptable to fire official having jurisdiction) to insure fire rating of each ceiling in which fixtures are installed.

G. COORDINATION MEETINGS:

1. Meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each light fixture mounting condition with ceiling type. During second meeting, coordinate fixture layout in each area.
2. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all fixtures and duct work in all areas.

H. ADJUST AND CLEAN:

1. Clean lighting fixtures of dirt and debris upon completion of installation.
2. Protect installed fixtures from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish.

I. SPARE PARTS:

1. Provide a spare set of diffusers (acrylic and/or glass only) for each fixture type and one for each additional 10 fixtures of each type; not to exceed 10 spares for any single fixture type.
2. In addition, furnish stock of replacement lamps amounting to 15 percent (but not less than one lamp) of each type and size used. Deliver replacement stock as directed to Owner's storage space.

3.2 FIELD QUALITY CONTROL:

- A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements.
- B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise remove and replace with new units, and proceed with retesting.
- C. At the time of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer.
- D. **GROUNDING:**
 1. Provide equipment grounding connections for each lighting fixture.

END OF SECTION 16510

SECTION 16561 – OCCUPANCY SENSORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Materials and Methods section, and is part of each Division-16 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. The extent of occupancy sensor work is indicated by drawings and schedules.
- B. Types of occupancy sensors in this section include the following:
 - 1. Control Pack
 - 2. Passive Infrared Wall Switch
 - 3. Ultrasonic Wall Switch
 - 4. Dual Technology Ceiling Sensor w/ Control Pack

1.3 QUALITY ASSURANCE:

- A. Comply with NEC and NEMA standards as applicable to construction and installation of occupancy sensors. Provide occupancy sensors which have been UL listed and labeled.
- B. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems, motor loads and any other passive infrared or microwave systems.

1.4 SUBMITTALS:

- A. **PRODUCT DATA:** Submit manufacturer's data on occupancy sensors, control modules, wiring diagrams, interconnection diagrams and any related accessories.
- B. Submit scaled drawings with lighting fixtures shown clearly marked by manufacturer showing proper product, location and orientation of each sensor.

PART 2 - PRODUCTS

2.1 MANUFACTURER: The manufacturer shall have a minimum of five years of experience in the sensor and lighting control industry. Sensors and related relays shall be compatible with the specific lighting types controlled. All sensors shall be of the same manufacturer, mixing brands of sensors is not acceptable.

- A. **PASSIVE INFRARED WALL SWITCH:** Where units are indicated provide a sensor that meets the following minimum requirements:
 - 1. Sensor shall utilize a dual element pyroelectric detector behind a lens to detect the

motion of infrared energy emitted by the human.

2. Lens shall be of the multi-element type that divides the field of view into forty zones of detection.
3. Sensor shall fit a single gang switch box and utilize a decorator cover plate.
4. Sensor shall not protrude more than 0.75 inches from switch box.
5. Sensor shall operate at 120VAC and 277VAC.
6. Sensor shall have a time-out delay, adjustable from 1 minute to 30 minutes.
7. Sensor shall have an Automatic/OFF switch on front of unit.
8. Sensor shall incorporate a daylight control. The adjustable ambient light control shall be adjustable from 20 to 420 foot-candles.
9. Sensor shall have a 170 degree field of view. Detection beam shall be horizontal.
10. Sensor shall use a dry contact relay to control the lighting load.
11. Sensor shall be rated for 0 to 600 watts at 120VAC and 277VAC and adapt automatically to the operating voltage.
12. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Hubbell-WS Series
 - b. Sensor Switch-WSD-P Series
 - c. Wattstopper-WS Series
 - d. Mytech-LP Series
 - e. Lithonia - LIRW Series
 - f. Novitas – 01-400/DL401

B. ULTRASONIC (MICROPHONICS) WALL SWITCH: Where units are indicated provide a sensor that meets the following minimum requirements:

1. Sensor shall utilize active ultrasonics to detect motion.
2. Sensor shall have two ultrasonic transmitters and one receiver.
3. Sensor shall incorporate an inrush current limiter circuit to protect the relay contacts.
4. Sensor shall utilize a dry relay contact for control of the lighting load.
5. Sensor shall have a time out adjustment from 8 seconds to 32 minutes. Timer shall be linear and controlled by a timer chip.
6. Sensor shall have automatic sensitivity adjustment and be microprocessor controlled.
7. Sensor shall have automatic gain setback to reduce the sensitivity after the sensor has turned off the lighting to prevent false tripping.
8. Sensor shall have transmitter control adjustments to prevent false tripping from hallway traffic.
9. Sensor shall have a 180 degree field of view, coverage up to 800 square feet, and shall detect six inches of hand movement towards the sensor at a distance of 22 feet. Sensor shall detect body motion towards the sensor at a distance of 32 feet.
10. Sensor shall operate at 120VAC and 277VAC.
11. Sensor shall be rated for 40 to 740 watts at 120VAC and 90 to 1400 watts at 277VAC.
12. Sensor shall be automatic on and shall have an automatic to off override switch on the unit. Switch shall be an air gap switch to disconnect power to the lighting load.
13. Sensor shall have a real time motion indicator on the front of the unit.
14. Sensor shall mount to a single or double gang switch box.
15. Subject to compliance with the above requirements, provide models of one of the following:

- a. Hubbell-ATU 1277 Series
- b. Sensorswitch-WSD-PDT-P Series
- c. Mytech LH-US Series
- d. Novitas – 01-250

C. DUAL TECHNOLOGY CEILING SENSOR: Where units are indicated, provide a sensor that meets the following minimum requirements:

1. Sensor shall incorporate ultrasonic (microphonics) and infrared technologies in a single unit.
2. Sensor shall be Class 2, low voltage; capable of mounting in the ceiling for maximum coverage.
3. Sensor shall use internal microprocessor for motion signal analysis and automatic self-adjustment.
4. Sensor shall have automatic self-adjustment algorithm which adjusts timer and sensitivity settings to maximize performance and minimize energy usage.
5. Sensor shall have manual time-out adjustment from 8 minutes to 32 minutes and automatic time out from 8 minutes to 100 minutes.
6. Sensor shall have test time-out setting of 8 seconds, with automatic return to 8 minutes after one hour if sensor is left in test mode.
7. Sensor's microprocessor shall automatically extend timer by 1 hour in response to recognition to false off condition. After 5 hours, sensor reduces extended time by 30 minutes and continues to reduce by 30 minute increments over the next few days.
8. Sensor's microprocessor shall automatically reduce either PIR or ultrasonic sensitivity in response to false on condition.
9. Sensor microprocessor will automatically monitor PIR background threshold signal level and makes corresponding sensitivity adjustments automatically.
10. Sensor microprocessor algorithm shall incorporate automatic adaptation to continuous airflow.
11. For airflow which is so intense as to mask motion, sensor shall flash indicator LED code to indicate excessive airflow.
12. Sensor's microprocessor shall use a four week learning period and develop a circadian calendar.
13. An internal 24 hour 7 day clock establishes what periods the room is typically occupied, biasing sensor to keep lights on while normally occupied and off when normally unoccupied.
14. Sensor shall have selection settings for the following dual technology schemes:
 - a. High Sensitivity and High Confidence (miser mode)
15. Sensor shall be available with either 180 degrees or 360 degrees coverage pattern.
16. Infrared lens shall have 360 degree field of view. Two types of lens shall be available, standard and extra dense.
17. Sensor shall have a variety of mask inserts for PIR coverage rejection to prevent false tripping.
18. Transducers shall be protected from tampering.
19. Sensor shall have manual adjustments for timer and sensitivities and override switches to force manual adjustment mode.

20. Sensor shall have adjustable sensitivity from 0% to 100% for both ultrasonic and infrared.
21. Controls shall be behind cover to resist tampering. All adjustments shall be accessible from the front of the sensor.
22. Sensor shall be available with a photocell adjustment from 20 to 3,000 Lux.
23. Sensor shall provide internal operating status and settings confirmation via LED motion lamp indicator.
24. Sensor shall have two (if 180 degree) or three (if 360 degree) real time LED motion indicators visible from the front of the unit: Red = infrared; green = ultrasonic.
25. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Hubbell-ATD Series
 - b. Sensor Switch-CM-PDT Series
 - c. Wattstopper-DT Series
 - d. Mytech-Omni-DT Series
 - e. Lithonia - LMTO Series
 - f. Novitas – 01-300/310

D. 24 VDC POWER/CONTROL PACK: Where units are indicated, provide a power/control pack that meets the following minimum requirements:

1. Control module shall consist of a DC power supply and a dry contact relay for switching a lighting load.
2. Control module shall be available in versions to accept 120, and 277 VAC line voltages.
3. Output shall be 24VDC nominal, and shall be inherently safe, low voltage, limited power output (Class 2).
4. Output shall supply 100mA current, in addition to current consumed internally to operate internal relay.
5. Relay shall utilize normally open, silver alloy dry contacts, and shall be rated for a 20A ballast load at 120V and 277V.
6. Relay function shall not require more than 5 mA control current to operate.
7. Control module shall have line voltage wiring, consisting of input voltage and relay contact connections, exiting from one end, and low voltage DC connections, consisting of ground, power, and control wires, exiting from the other end.
8. Control module shall be sized to fit inside a standard 4" x 4" junction box.
9. Control module shall be equipped with a 1/2" EMT threaded male fitting on the line voltage end, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low voltage wiring external.
10. Control module shall be equipable with accessory 1/2" EMT threaded male fitting on the low voltage end, such that it may be mounted to the inside of a ballast cavity with the box and line voltage wiring internal to the cavity and the low voltage wiring external.
11. Slave module shall be available for switching additional circuits. Slave module has same construction and specifications as control module except without power supply function.
12. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Hubbell-CU Series

- b. Sensor Switch-PP-20 Series
- c. Wattstopper-BEP Series
- d. Mytech-MP Series
- e. Lithonia - LPCS Series
- f. Novitas – 13-051

PART 3 – EXECUTION

3.1 INSTALLATION OF LIGHTING CONTROL EQUIPMENT:

- A. Install occupancy lighting control system components and ancillary equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that lighting control equipment complies with requirements.
- B. Comply with requirements of NEC, and applicable portions of NECA's "Standard of Installation" pertaining to general electrical installation practices.
- C. Coordinate with other electrical work, including raceways, and electrical boxes and fittings, as necessary to interface installation of lighting control equipment work with other work.
- D. Contractor shall be on site as required, to adjust lighting control units for proper operation.
- E. Mount the switchpack in a standard 4" junction box or extension through a ½" KO in the cover plate. Refer to manufacturer supplied mounting instructions.
- F. Provide 5 spare sensors for each type used on project.

3.2 FIELD QUALITY CONTROL:

- A. Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements.
- B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- C. Contractor shall visit the job site 3 months after the owner has taken occupancy and adjust any units not operating properly, otherwise remove and replace with new units.

3.3 MANUFACTURER AUTHORIZED PERSONNEL TRAINING:

- A. Building Operating Personnel Training: Train Owner's building personnel in procedures for starting-up, testing and operating lighting control system equipment.

END OF SECTION 16561

SECTION 16721 - FIRE ALARM AND DETECTION SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of fire alarm and detection systems work is indicated by drawings, schedules and as specified herein.
- B. Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories. Provide components and systems which are UL-listed and labeled for fire alarm. Provide fire alarm and detection systems and accessories which are FM approved. Comply with State and local requirements as applicable.
- C. Comply with applicable provisions of current NFPA Standards 72A for Local Protective Signaling Systems, 72B Auxiliary Protective Signaling Systems, 72C Remote Station Protective Signaling Systems (as applicable), local building codes, and meet requirements of local authorities having jurisdiction.

1.3 SUBMITTALS:

- A. **PRODUCT DATA:** Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
- B. **SHOP DRAWINGS:** Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel. Provide dimensioned drawing of Fire Alarm Control Panel and Building Graphic.
- C. **CERTIFICATION:** Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system will be installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72.
- D. Provide to the Fire Marshall's office the following:
 - 1. A complete set of shop drawings indicating:
 - a. Location of all alarm-initiating and alarm-signaling devices.
 - b. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.
 - 2. Wiring diagrams for:

- a. Alarm control panels.
 - b. Auxiliary function relays and solenoids.
 - c. Remote signaling equipment.
 - d. Standby battery calculations, including voltage drop calculation.
3. A complete equipment list identifying:
- a. Type
 - b. Model
 - c. Manufacturer
 - d. Manufacturer catalog data sheets
 - e. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)
4. A complete zone list identifying all:
- a. Alarm-initiating and alarm-signaling devices.
 - b. Remote signaling and auxiliary function zones.
 - c. Specific devices associated with each zone.

E. Submit to State and Local Fire Marshall, a complete Certificate of Compliance

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. MANUFACTURER: Subject to compliance with requirements, provide fire alarm and detection systems of one of the following:
- 1. Game Well, By Nelson Fire

2.2 FIRE ALARM AND DETECTION SYSTEMS:

- A. GENERAL: Provide an electrically operated, electrically supervised fire alarm system as described herein. Include control units, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and accessories required to provide a complete operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 16, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc. Minimum wire size to be #14 AWG copper.
- B. SYSTEM TYPE: Analog addressable, non-coded. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes all fire alarm signaling devices, sounding a non-coded alarm and providing device identification on an annunciator panel.
- C. SYSTEM OPERATION: Provide system such that any manual station or automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the manual station or initiating device is restored to normal and the fire alarm control unit reset. Annunciate alarm signals by device at the control panel and all remote

annunciators. Provide all conductors, raceway, equipment and labor to accomplish the following:

- D. For fans which are not part of the smoke evacuation system, deactivate air supply and return fan units simultaneously by means of a supervised master fan shutdown relay with slave relays as required. Restart air units automatically after panel has been reset. Provide a bypass switch for master fan shut down relay for drill purposes, and indicate by a locked-in lamp that the circuit has been bypassed.
- E. Selectively activate and/or deactivate fan units as required.
- F. Release all magnetic door holders upon activation of an alarm from any device by use of a master relay in the control panel.
- G. Provide supervised circuits for the following:
 - 1. Close dampers upon activation of an alarm from any device through the HVAC interface relays at the Fire Command Center.
 - 2. Recall elevators, upon activation of an alarm, to the floor of building egress unless the alarm is on the egress floor, in which case recall elevator to the level designated by the Fire Marshall. Cooperate with the elevator supplier to ensure complete operable system. Provide shunt trip breaker(s) as required.
- H. Central Station Monitoring. Provide a UL listed fire control communicator in accordance with NFPA 71 with a minimum of two reporting zones to the central station. Provide a communicator with dual phone lines for central station reporting by using BFSK or pulsed single round fast format. Provide integral trouble annunciator. Provide with compatibility for automatic test reports every 24 hours. Provide system and components which comply with UL 2635 and UL 864.
- I. Provide fire alarm control panel with capability of shutting down individual initiating devices for maintenance purposes without affecting the continued operation of other initiating devices.
- J. Provide manual fire alarm stations in boiler rooms, and main administrative office. Provide external alarm horns sufficient to be heard in all parking areas.
- K. Sprinkler Supervision. Provide a signal initiating and supervisory circuit to each PIV (post indicator) valve, and to each sprinkler riser and subdivision. Provide continuous alarm signal upon actuation of any water flow signal initiating device. Sound alarm until the condition has been corrected and the panel manually reset as required by UL864. Provide separate alarm zones for: (1) alarm zones from "waterflow alarms", (2) alarm zones from "supervisory alarm" indicating sprinkler system trouble. Provide power to all alarm bells furnished under Division 15. Review final fire sprinkler drawings and coordinate for panel, flow and tamper switch locations.
- L. Provide relays, monitor modules and connections as required at control panel of kitchen hood suppression system for initiation of alarm signal to fire alarm control panel. Connect hood suppression control panel to shunt trip breakers as required.
- M. Provide all required wiring from gas shut off valve to the hood suppression control panel. Make

all connections to insure a properly operating system. Verify with Mechanical Contractor.

2.3 SCOPE OF THE WORK:

- A. Provide all new fire alarm devices.
- B. Provide duct smoke detectors and fan relays at all fan units 2000 CFM and over. Shut down all supply and return fans upon a general alarm signal.
- C. All initiating devices connected to the fire alarm control panel shall be analog addressable.
- D. All wiring shall be in conduit (3/4" minimum). All conduit and connectors, shall be made of steel. All conduit runs shall form a complete loop from the fire alarm control panel.
- E. Updated system map at control panel.

2.4 FIRE ALARM CONTROL PANEL (EXISTING):

- A. The fire alarm control panel shall be microprocessor-based. Each loop shall be capable of 99 analog addresses and 98 monitor and/or control addresses.
- B. If the microprocessor fails, the system shall execute a default signaling program. This program will enable the panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the device wherein the alarm originated. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.
- C. The fire alarm control panel shall contain a 80 digit alphanumeric display and permit the user to perform all necessary functions including but not limited to the following:
 - 1. Alarm/Trouble Acknowledge.
 - 2. Alarm Silence
 - 3. Reset
 - 4. Lamp Test
 - 5. Control of Initiating Devices (on/off)
 - 6. Control of output modules (on/off)
 - 7. Change sensitivity of devices
 - 8. Change time
 - 9. Walk test
 - 10. Check system on battery voltage and current
- D. The fire alarm control panel shall be capable of alarm verification. The control panel shall indicate which smoke detector is in alarm during the pre-alarm window.
- E. All alarm signals shall be locked in at the panel until the operated device is returned to it's normal condition and the control panel is manually reset.
- F. Alarm or trouble activation of initiating points shall be represented in English on the alphanumeric display on both the remote operating panel and the fire alarm control panel

indicating the address of the specific device, i.e. Device L4S76, Smoke Detector, 1st floor Rm. 17.

- G. Each initiating and signal circuit shall be electrically supervised for opens, shorts, and ground faults in the wiring.
- H. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault condition.
- I. The system communication loops shall be capable of being wired using Class "A" (Style 6) supervised circuits (a ground fault on either conductor or a break shall not prevent a device from operating on either side of the break)
- J. The fire alarm control panel shall contain circuitry permitting the transmission of trouble and alarm signals over leased phone lines by the means of reverse polarity. There shall be a supervised disconnect switch to allow testing of the fire alarm control panel without transmitting an alarm to the central station.
- K. The fire alarm control panel shall include the following features:
 - 1. Auxiliary SPDT alarm actuated contacts.
 - 2. Auxiliary SPDT trouble actuated contacts.
 - 3. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions). This electronic circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting the normal microprocessor scan and minimize resultant nuisance troubles and/or alarms.
 - 4. A ground fault detector to detect positive or negative grounds on the initiating circuits, signal circuits, power circuits, and telephone line circuit. A ground fault code on the alphanumeric display shall provide indication of either a positive or negative ground fault and shall operate a general trouble but shall not cause an alarm to be sounded
 - 5. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored and shall have a distinctive error message.
 - 6. Lightning protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.
 - 7. Individual circuit breakers shall be provided for the following: smoke detector power, main power supply, signal circuit #1, signal circuit #2, battery standby power, and auxiliary output.
 - 8. The fire alarm control panel shall be of dead-front construction. One key shall allow access to all electronics or to the dead-front access to the operator functions
 - 9. Opening the main door shall expose all components for inspection or adjustment without further dismantling of the cabinet, control unit, or wiring.
 - 10. It shall be possible to check and adjust the sensitivity of all analog devices from the main fire alarm panel.
- L. The fire alarm control panel shall have batteries capable of powering the system for (24) hours in standby condition and (5) minutes in alarm.

- M. There shall be no special tools required for the programming of devices. A standard slot head screwdriver only.

2.5 MONITOR MODULE (FCI AMM-2):

- A. Remote identification module devices shall be attached to any single normally open initiating device (heat detector, waterflow switch, duct detectors, sprinkler, tamper switches, kitchen hood, pull station, etc.). The modules shall supply addressing and status information to the Fire Alarm Control Panel through the dual loop module.

2.6 CONTROL POINT MODULE (FCI AOM):

- A. The control point module shall be connected to the same loop as the initiating devices, and shall provide a relay output (Form "C" 2 Amp @ 24 VDC, resistive only).
- B. This relay output shall be used to perform auxiliary functions.
- C. When the AOM is activated, the red "ACTIVE" LED shall be on solid. Under normal conditions, the red "ON LINE" LED shall flash.

2.7 MANUAL FIRE ALARM STATION (FCI, MS-2, W/AMM-2):

- A. Provide red enclosure, manual fire alarm stations with the following features:
 - 1. Die-cast construction, for semi-flush mounting.
 - 2. Addressable alarm type electrically compatible with system requirements.
 - 3. Double Action
 - 4. Break glass design requiring unit to be opened for resetting, and requiring resetting before closing. Provide one spare "glass" for each manual station. Key reset, keyed like fire control panel.

2.8 IONIZATION SMOKE DETECTORS (FCI ASD-I W/ADB-F BASE):

- A. All ionization smoke detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All ionization fire detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

2.9 PHOTOELECTRIC DETECTORS (FCI ASD-P W/ADB-F BASE):

- A. All photoelectric detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All photoelectric detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

2.10 THERMAL DETECTORS (FCI ATD WITH/ADB-F BASE):

- A. Thermal detectors shall operate on the Rate-of-Rise principal. The detectors shall have a fixed

temperature rating of 135 degrees Fahrenheit. Exception: in Boiler rooms, provide temperature rating of 200 degrees Fahrenheit.

1. The heat detector shall consist of a base and a head.
2. The base shall be capable of accepting either a smoke detector or a 135 (or 200) degree heat detector.
3. The head shall automatically restore to its normal standby condition when the temperature returns to its normal range.

2.11 AUDIOVISUAL ALARM HORNS (FCI, HMF/STS SEMI-FLUSH MOUNTED OR EQUAL):

- A. Provide audio-visual alarm horns with the following features:
 1. Die cast or stamped steel construction, finished in red enamel, suitable for indoor or outdoor application.
 2. Capable of 90 db (UL rating) sound level at 10 feet.
 3. Flush mounted
 4. Integrally mounted flashing light unit, with Lexan lens with block letters "FIRE", and minimum flash rate of ONE per second, and 110 candela minimum.
 5. Electrically compatible with system requirements.
 6. Horns shall sound the temporal pattern (code 3) until silenced.
 7. Audiovisual alarm horns shall have the ability to silence horns while maintaining the strobe flash, until reset.
 8. Mechanical horn mechanism only, electronic horns are not acceptable.
 9. Maximum 24 horns per circuit, maximum 8 strobes per circuit.
- B. Strobes shall be synchronized when there are three or more within sight and less than 55 feet of viewer.

2.12 AUXILIARY RELAY (FCI, ARB-C):

- A. Remote auxiliary relay boards shall be rated at 10 AMPS @ 120 VAC. A red LED shall light to indicate relay activation. All relays shall transfer on general alarm and latch on until reset. All relays shall be supervised. The control output provided can be used in conjunction with fire alarm applications (i.e. fan controls, dampers, doors, and any other general alarm control).

2.13 INITIATING MODULES:

- A. Provide style "6" initiating modules capable of receiving and annunciating an alarm from any detector, even with a single fault condition on any initiating circuit.
- B. Power all smoke detectors from the "Style 6" initiating loop wiring. For systems which power smoke detectors separately from the "Style 6" loop, provide monitoring for both the power source and the independent initiating wiring, so that complete trouble and alarm indication is achieved by loop. Provide capability to operate all smoke detectors, even with a single fault condition on the smoke detector power wiring. Provide one spare initiating circuit.

2.14 SIGNALING MODULES:

- A. Provide signaling as required. Provide power adequate to sound all signaling devices

concurrently. Provide supervised indicating circuits for polarized 24V D.C. alarm signaling devices. Provide 2 spare signaling circuits.

- B. Each signal circuit shall have a separate disconnect switch for servicing the fire alarm system. Each and every indicating circuit shall have a distinct location description. Power supply shall be at fire alarm control panel. Remote power supplies and indicating circuits will not be acceptable.

2.15 SUPPLEMENTAL NOTIFICATION CIRCUITS (FCI SNAC-4):

- A. Provide supplementary notification appliance circuit panel(s) as required. The 'SNAC' shall be capable of supplying up to four Class A, Style Z notification appliance circuits. The panel shall contain its own battery charger, regulated power supply, and shall be supervised for ground fault, overcurrent, open circuits and low battery conditions. Ground fault, battery and circuit trouble conditions shall transmit a trouble signal to the main fire alarm control panel.

2.16 SYSTEM CONFIGURATION PROGRAMMING:

- A. To help the owner in programming, system changes, and servicing, the fire alarm system shall have the following functions.
 - 1. The FACP shall be capable of an auto-configuration, which via a password, all analog devices and panel modules are automatically programmed into the system. At this point the system will operate as a general alarm system without any other programming.
 - 2. If any two devices are addressed the same, the LED's on both devices will light steady and the panel will read "extra address and the address number".
 - 3. If any device is installed and not programmed into the system the LED will light steady and the panel will read the same as above.

2.17 BATTERIES/POWER SUPPLIES:

- A. Provide standby batteries capable of operating fire alarm system for minimum of 24 hours, then operating all indicating units for at least five minutes. Locate batteries in fire alarm control unit, or in similar type enclosure located as directed. Provide all interconnecting wiring. Place batteries which vent hydrogen gas in separate enclosure. Provide 30 percent spare capacity.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS:

- A. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECA's "standard of installation".
- B. Install wiring, raceways, and electrical boxes and fittings in accordance with Division 16 Basic Materials and Methods section, "Raceways", "Wires and Cables", and "Electrical Boxes and Fittings", and in accordance with other sections, as applicable.
- C. All wire used on the fire alarm system shall be U.L. Listed as fire alarm protective signaling

circuit cable per NEC, Article 760.

- D. If twisted or shielded wire is required or recommended by the manufacturer it must be used.
- E. Review proper installation procedure for each type of device with equipment supplier before installation. Label each junction box throughout system, "fire alarm", and paint cover of junction boxes red.
- F. Where smoke or heat detectors are specified, install device a minimum of three feet from adjacent air supply diffusers to ensure proper operation of device.
- G. Refer to NFPA for spacing and exact placement of fire alarm devices.

PART 4 - FINAL ACCEPTANCE AND GUARANTEE

4.1 GUARANTEE:

- A. Furnish a three-year guarantee for all equipment, materials and installation, including all labor, transportation, and equipment.
- B. Emergency Response. The fire alarm equipment supplier shall provide an emergency response within four hours of any reported system failure to resolve the problem on a continuous basis.

4.2 PRE-TEST:

- A. The contractor shall with a representative of the manufacturer conduct a test 3 days before the final test to verify operation of all devices. Any problems must be corrected before the final test.

4.3 FINAL TEST:

- A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:
 - 1. The contractor's job foreman, a representative of the manufacturer, a representative of the owner, shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel. Fan shutdown and door holder circuits shall operate.
 - 2. Conduct a full 24 hour test of battery operation. System shall be put on the batteries for a full 24 hours and all notification appliances shall be operational for a period of 5 minutes.
- B. The supervisory circuitry of the initiating and indicating circuits shall also be verified.

PART 5 - AS BUILT DRAWINGS AND OPERATION AND MAINTENANCE MANUALS:

5.1 LABELING:

- A. All devices shall be labeled with their appropriate address. The labels shall be 18 point pressure sensitive labels.
- B. All initiating devices shall be programmed to include the device address and a complete user text English location description, i.e. Device L4S76, Smoke Detector, 1st floor Rm.17

5.2 AS BUILT DRAWINGS:

- A. A complete set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system. Vendor shall not request drawings from the Engineer. Vendor shall request current architectural drawings from the Architect and include all cost with bid.
- B. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel and all remote operating panels. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various devices and wiring by the use of different colors (minimum of five colors).
- C. Provide a CD to the Owner containing the information specified below. The CD shall include all information required to allow the Owner to change the fire alarm program themselves. The CD shall contain a minimum of the following:
 - 1. CAD drawing files of building fire alarm map.
 - 2. CAD drawing files of as-built fire alarm components and point to point connections.
 - 3. General configuration programming.
 - 4. Job specific configuration programming.
 - 5. Tutorial file on complete programming of fire alarm system.

5.3 OPERATING AND MAINTENANCE MANUALS:

- A. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.

5.4 TRAINING:

- A. Provide four (4) hours training on the operation and installation of fire alarm system, at job site, at no cost to owner.
- B. Provide programming training and software sub-licensing in owner's name. Sub-licensing agreement shall include the U.L. requirement to allow the owner to do any programming that the supplier is allowed to do during commissioning, testing, service and field additions or deletions to the fire alarm system. The fire alarm supplier shall provide this training and licensing at no cost to the owner, including transportation (if outside Salt Lake City), lodging, meals, and training manuals.

HFS*Architects* # 0517.01

**Thayne and Alumni Centers Remodel / Student Center Bldg.
Salt Lake Community College / Redwood Campus**

END OF SECTION 16721

SECTION 16740 - TELEPHONE SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. The extent of telephone system work is indicated by drawings and is hereby defined to include, but not be limited to raceway, outlets, grounding and miscellaneous items required for complete raceway system.
- B. Refer to other Division-16 sections for requirements for raceways, trays, boxes and fittings, wiring devices (plates), and supporting devices, and other sections, as applicable.

1.3 QUALITY ASSURANCE:

- A. Comply with applicable portions of NEC as to type products used and installation of components. Provide products and materials which have been UL-listed and labeled.

PART 2 - PRODUCTS

- A. GENERAL: Provide complete raceway system for telephone including but not limited to, raceway, outlets, device plates, backboards, grounding and miscellaneous items as required.
- B. Provide 4" square box with appropriate plaster or tile ring.

PART 3 - EXECUTION

3.1 INSTALLATION OF TELEPHONE SYSTEM:

- A. GENERAL: Install raceway system as indicated to comply with NEC and recognized industry practices. Run 1" conduit from each telephone outlet to accessible ceiling space. Provide nylon pull cord in all empty raceway.

END OF SECTION 16740

